THE GRAY SHEET

Computer Industry REPORT

International Data Corporation
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5 Speen Street, Framingham, MA 01701

THE GRAY SHEET
Computer Industry REPORT

Global market intelligence on the information technology industry since 1964.

Business Burgeons on the Net: A Shakeout Looms

1995 will be remembered as the year the Internet carved out permanent space in the cyber landscape of mainstream computer users. The number of active World Wide Web users surged from 1 to 8 million. Much of that growth came in the last half of the year as subscribers to online information services, like Prodigy, CompuServe, and America Online, began using newly created gateways to the Web.

This growth in users, along with inordinate amounts of industry and media hype about the Internet, has prompted feverish investment in the vendor community to develop products and services for an envisioned future market of scores, if not hundreds, of millions of Web users.

As 1996 unfolds, predictions of a commercial explosion abound. That perceived opportunity has prompted feverish development of Web sites and Web pages among companies and organizations seeking to market goods and services over this mysterious new medium.

But if Internet commerce is shopping on the Web, then Web sites and Web pages are the storefronts and shelves of this new electronic marketplace. During 1995, IDC began wondering exactly how the dynamics of this "shopping experience" might develop over the next few years. Would users find the goods and services they want? Would they recoil from the increasing clutter of sites on the Web? Would suppliers overbuild and produce a glut of Web pages? Would the merchandise on the electronic shelves of the Web gather dust? The answer is yes. And no.

To cut through the hype and better understand the dynamics of Internet commerce, IDC has established the Internet Commerce Market Model. The model provides a methodology for analyzing current and future demographics and dynamics of Web usage. In this issue, *The Gray Sheet* provides a discussion of the underpinnings of that analysis and presents a predictive timeline for businesses on the Internet based on the model. For the rest of the decade, the Internet Commerce Market Model offers this scenario:

- The number of Web users will continue grow faster than the number of Web pages until late 1996, after which the number

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of pages will grow faster than the number of users for a period of time.

- The growth in number of pages on the Web will cause a "backlash" in the Internet commerce market as users become frustrated surfing a Web clogged with Uniform Resource Locators (URLs) and as Web page owners question the value of their investments.
- After a down year in 1997, Internet commerce will pick up again as tools for navigating the Web and conducting commerce over the Web improve, as transaction activity and sizes increase, and as the growth in URLs stabilizes to fit the number of Web users.
- A second slowdown will occur later in the decade as growth in the number of users slows as a result of saturation. Growth then in commerce over the Internet will depend on transaction growth.

IDC's scenario yields a measure of Internet commerce over the Web in the year 2000 in the range of $150 billion to $200 billion — the value of goods and services purchased over the Web during the year. But getting to that level from today's dribble of activity will not necessarily be a smooth trip.

The IDC Internet Commerce Market Model

To address the question of how commerce over the Internet will evolve, IDC has developed the industry's most complete and comprehensive model of Internet usage dynamics and demographics: The IDC Internet Commerce Market Model.

The model is based on IDC's vast global research base, more than 40,000 interviews with homes and business in over 15 countries each year, 15 years' experience monitoring business and consumer online markets, and a series of specially tailored quarterly multinational surveys of Web user behavior.

IDC believes that this new model offers a one-of-a-kind view of the Internet market that includes both the industry's deepest, most granular understanding of Internet and Web demographics and behavior and the industry's most comprehensive and granular knowledge of the total available market. Using this tool, IDC clients and the industry as a whole can begin to distinguish realizable market opportunity from hype and hysteria.

At the same time, using the output of its model, IDC has developed an index to represent the current and forecasted opportunity for commerce on the Web. Called the IDC Web Index™, the basic equation of this model is simple:

$$\text{IDC Web Index} = \frac{\text{Web Hours}}{\text{Web Pages}} \times \text{Transaction Activity}$$

The IDC Web Index™

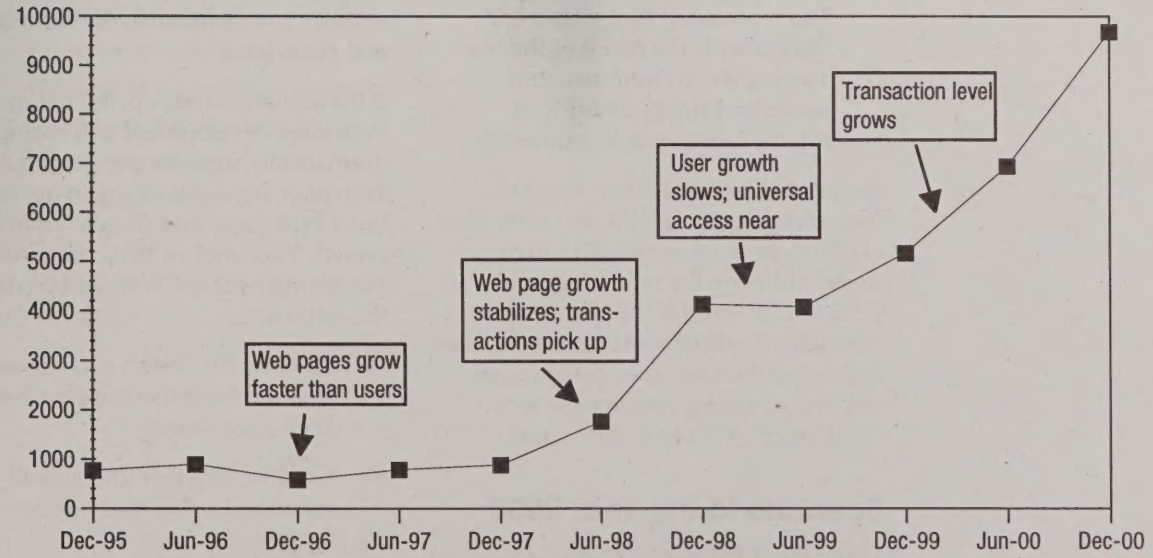
Web hours are the aggregate hours per month Web users spend cruising the Web; Web pages are the total numbers of URLs in the Web; transaction activity is the number of users conducting business on the Web times a coefficient representing the average size of a transaction. An index value of 100 was set for December 31, 1994.

IDC believes that the IDC Web Index is the single best shortcut to understanding the key dynamics of commerce over the Web. For Web page developers — most companies in business today — it offers a measure for estimating return on investment (ROI) for development. For vendors, it offers a gauge of potential market demand for tools in support of Internet commerce. For instance:

- If the number of Web users grows faster than the number of pages, the ROI of developing a Web pages goes up. There are more eyes to view each page.
- If the number of Web pages grows faster than the number of users, the ROI of a page goes down. There's increasing competition for user mindshare.
- If the number of pages keeps pace with the number of users, the key determinant of Web page ROI is transaction intensity. Each user buys more off the Web.

For vendors selling into the Web market, customers include both Web users (shoppers) and Web page developers (merchants). Ultimately, a down index means a down market for all sorts of tools and services for commerce over the Web. This is particularly true for those sold to Web page developers, such as servers and development tools. An up index means market opportunity will grow (along with competition).

The IDC Web Index™
Worldwide Edition, Forecast, 1995–2000



Source: International Data Corporation, 1996

Internet Commerce in 1995

Using the IDC Internet Commerce Market Model, IDC has developed both current and future views of the market. Driving the forecasts are separate forecasts of the number of future Web users, the number of future Web pages, and the size of the average transaction.

Note the following:

- Driven by the jump in Web users coming from online service subscribers, the number of Web users jumped from 1 million at the beginning of the year to 8.3 million at the end. The index jumped from 100 to 773.
- The number of URLs, as measured by Lycos Inc., grew by a factor of 2.7 to 14.0 million.
- The average number of hours per user per month spent on the Web doubled from 8.7 to 17.3, enough to compensate for the increase in URLs.
- A spike in the index occurred in August and September, primarily as a result of America Online giving users Web access last summer; in October the index flattened as a result of growth in Web pages. The rebound in November and December is the result of the seasonal spike in computer shipments and the availability of Internet access via Windows 95.

Because each Web site may support (and each home page link to) multitudes of URLs, there are more URLs than users. Although the ratio dropped in 1995, IDC believes it will rise again as Web page development efforts bear fruit and as the Web becomes the universal electronic catalog. Perhaps the term "junk page" will come into vogue.

Scenario to the Year 2000

Using the IDC Internet Commerce Market Model, IDC has also developed a scenario for future commerce over the Web as follows:

- There is a dip in the index at the end of 1996 as the number of URLs begins to grow faster than the number of users. This is the classic scenario of a start-up market, where pent-up demand generates investment in capacity that comes on line just as early market growth cools. There is a short-term glut of Web pages.
- A rebound in growth starts in 1997 and runs through 1998 as the ratio of Web pages to users stabilizes and as transaction activity begins to increase. The number of URLs is still growing, however.
- Growth again flattens in 1999 as the number of users saturates at near universal access.
- A final rebound takes place by the end of the decade as the number of URLs reaches equilibrium with the number of users and transaction activity. Commerce over the Web becomes commonplace.

The Implications

The fundamental scenario offered by the IDC Internet Commerce Market Model is of rapid growth in Internet commerce activity punctuated by two major market corrections, the first within 12 to 18 months, the second several years later.

If the scenario holds up, the nature of Web page development will change dramatically from simply getting a Web page up and running to developing a Web page that stands out in a crowd. This implies that companies marketing over the Web will be doing the following:

- Looking for design and content creation tools that support better Web page design
- Banding together into logical communities (malls) that lure customers
- Marketing and advertising their Web pages

The IDC Internet Commerce Market Model™

To fashion a view of the current and future market for commerce over the World Wide Web, IDC has developed the industry's most comprehensive model of Web user demographics, usage characteristics, and market opportunity. The model is designed to capture IDC's best information at the time, offer a platform for increasing granularity, and display our current forecast assumptions.

The basic refresh cycle of the model is quarterly because IDC tracks device shipments quarterly and conducts quarterly studies of Web usage, but the model can accommodate a monthly view that can help look at discrete events.

Inputs

of devices with Internet access
# devices with Web access
# active Web users
# hours per user on the Web per month
# users buying over the Web
# transactions/month/buyer
$ value of transactions
# Web pages (from Lycos Inc.*)
Splits by U.S. and worldwide
Splits by home and business
Splits by new and existing users

Supporting Data

PC shipments and installed base
Terminal shipments and installed base
Videogame shipments and base
Interactive cable deployment
Technology (e.g., Pentium) adoption
online users U.S., worldwide
online users with Internet access
Online usage characteristics
Windows 95 shipments
Browser shipments
IP address forecasts
LAN gateways
Internet servers
Consumer market demographics
SOHO market demographics
Medium/large company demographics
Direct-mail response rates

Validation points

% of installed base with Web access
% of installed base actively using Web
Ratio of home-to-business usage
Total Web hours/month (vs. bandwidth)
User hours/month on Web vs. TV
Web vs. other online service usage
# Web pages per buyer
# Web pages per user
$ transactions per Web page
$ transacted annually over the Web

Sources

IDC PC shipment/base data by
- PCs, terminals, software worldwide, region, country
- Consumer and business
- Industry
- Quarterly views

IDC annual *Global IT Survey*
- 8 countries
- 20,000 responses

IDC/LINK *New Media Survey*
- 14 countries
- 15,000 responses

IDC *Biannual Web Site Survey*
- 3 countries
- Conducted on Web

IDC *Quarterly Internet Surveys*
Lycos Inc.* (URLs)

* Lycos Inc. (Http://www.lycos.com) publishes information about Internet and Web sites, including nontext resources, like graphics and sound, in its Catalog of the Internet. It is the exclusive licensee of the Lycos spider technology developed at Carnegie Mellon.

Source: International Data Corporation, 1996

IDC Web Index™, Key Forecast Assumptions

Input Fields	Trend
Number of users	Based on three years' cumulative shipments of PCs to homes, businesses, both U.S. and non-U.S., IDC's installed base is bigger but includes older machines not likely to be used to access the Internet. This scenario assumes that PC access is a good proxy for users, or that new Internet devices would cannibalize PCs as access devices or simply take a share of users' hours on the Web; IDC may later change this assumption.
Internet access	Grows from 30% of home computers and 40% of business computers in December 1995 to 95% each in 2000; universal access is at hand. Driven by current online user base, shipments of Win95, and IP address-enabled PCs.
Web access	Grows from 70% of home users with Internet access in 1995, and 65% of business users to 98% in 2000 for both categories. International at 50% of U.S. for home users, 66% for business users.
Active Web users: home	Sixty-five percent of users with Web access in 1995 growing to 95% by June 1998 and staying there. Web usage becomes a buying criterion for computers.
Active Web users: business	One active user for every seven users with access in 1995, since not everyone avails him- or herself of LAN gateway access to the Web. Ratio drops to 1.5 to 1 by December 1999 and stays there.
Web hours/month: home	Twelve hours in 1995 growing to 18 by 2000; first month for new users calculated at 10 extra hours for exploration (and free trial usage).
Web hours/month: business	Fifty percent more than home hours under the assumption that Web access is part of the job function.
% of users as buyers: home	Grows from 28% in 1995 to 67% in 2000. Figures for 1995 and 1996 based on IDC surveys; 2000 figure assumes market is catering to selling products (catalog model) to consumers.
% of users as buyers: business	Grows from 19% in 1995 to 45% in 2000. Assumes some companies routinely buy over the Web but most individuals in business don't.
Transaction activity	Assumes transaction value per year per buyer grows by a factor of 36 from 1995 to 2000 ($75 to $2,500) per buyer. This averages home and business buyers and is the most volatile component of the index forecast. At this level, $186 billion a year is purchased over the Web in 2000. Purchase information must be received over the Web, but the transaction may be completed over the phone.

Continued

Continued

IDC Web Index™, Key Forecast Assumptions

Input Fields	Trend
New user transactions	Assumes new users buy one-tenth as much as regular buyers in their first month (during trial period).
Web Pages	Uses Lycos URL count through September 1995, estimates for 4Q95 based on last three months' growth rate. Forecast for next five years based on URL per-user growth from 2 to 45, and from URL per buyer from 8 to 100. Forecast assumes URL "response rate" fits direct response model.
Calculated Fields/ Cross Check	
Web users as % of PC base	Grows from 5.3% in 1995 to 56.0% by 2000.
Internet commerce value	Grows from $100 million in 1995 to $186 billion annually to 2000; the transaction may be completed off the Web.
Revenue per URL	Grows from $9 per page per year to $85 (with a dip down to $3), but by 2000 a small handful of Web pages will be generating revenues. Revenue per URL for commercial pages could be as high as $900, based on an assumption that one-quarter of URLs are commercial pages, and of those, 90% of revenues go to 10% of the URLs. Depending on the number of URLs, a single home page or Web site could be earning millions of dollars.

Source: International Data Corporation, 1996

- Getting anxious to develop direct transactions off the page (rather than let the customer walk out of the store)

The scenario also implies that the timing of Web page development will be an issue. Companies late to the scene will be entering a crowded market and will lack experience customizing their Web pages to their market segments. Our assumption is that Web pages will stratify into a handful of high-volume, high-value pages and all the rest.

In fact, the ubiquity of the Web and the sheer number of Web pages implies that companies selling over the Web will need ways to segment their markets much in the way that today's direct-mail and catalog companies segment their markets. Tools and techniques that deliver qualified leads to the right Web page at the right time will be in demand. Here is one of the areas in which Web services, like those contemplated by the telephone and cable companies, might come in handy.

Finally, the growth of the market in waves indicates that vendors selling tools and services to support Internet commerce over the Web will want to time their product and marketing strategies to gain share during the booms and consolidate financial positions during the busts.

What If Assumptions Change?

Although IDC believes its current research has the best handle in the industry on Internet and Web demographics, usage, and market opportunity — both in the United States and other regions of the world — the future contains a lot of unknowns.

How much will people spend over the Internet? It depends on what there is to buy, how secure the transactions are, how easy it is to get on the Internet and find what they want, among other factors. How many hours each of us spends on the Web depends on whether it becomes part of our job description or it simply eats into leisure time. How many Web pages is too many depends on how easy it is to navigate the Web, how easy it is to find the pages you want to view at a particular time, and how much it costs to develop a page.

The IDC Internet Commerce Market Model and the associated IDC Web Index are designed specifically to allow both increasing granularity of analysis by country, by customer segment if it comes to that, and changing assumptions. Just as the Dow Jones average of 30 industrials adjusts for the adding or deleting of stocks and stock splits, the IDC Web Index can accommodate changes in data sources while preserving an ongoing record of commerce that represents our best information at the time.

IDC will continue to refine both the model and the index as understanding the Internet and Web user demographics and behavior becomes more critical to IT vendors and users.

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Mass Market Interactive Services: Modest Gains, Irregular Traffic Patterns, Slow Speed Ahead

In 1995, video-on-femand (VOD) was heralded as the first curl of a new wave of lucrative consumer-targeted interactive services. Trials and alliances were set up to guide transport providers, managers, and server suppliers through the uncharted waters of an emerging yet ill-defined marketplace. Twelve months later, mass market interactive services is still regarded as a viable market opportunity for IT suppliers, but the route to success is no more clear. A sea change is under way in the arena of broadbased interactive services. After a year of churn, some interactive trials have been completed and others canceled. Still more are planned throughout 1996.

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As 1996 unfolds and more consumers participate in the trials, a clearer mass-market profile will emerge. The financial risks remain high, and "killer applications" have yet to materialize. But the cardinal rule to consumer acceptance remains "keep it simple and cheap." The overriding issues linger: What does the consumer really want, and what is the consumer willing to pay? Will this be a push or pull marketing scenario, regardless of technology platform or who owns what?

Earlier efforts to leap into new services have been swiftly downgraded in favor of adopting a slower migration path that depends more heavily on the progress of technology, further government regulation, and financial rate of return. A consistent strategy is lacking. First, providers pushed for the architecture/technology approach. Next the emphasis was on content, content, content. Presently, the paradigm has shifted to "maybe we should revisit" the delivery method, standards, financing (consumer demand), and regulatory issues.

A degree of uncertainty still pervades the marketplace as shifts in technology platforms and delivery continue to reshape the nature and thrust of interactive trials. The Telecommunications Bill, finally passed and signed into law, may prove to be little more than a federal nod of approval for the players to find their own ways. The players,

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however, appear to be a long way from strategic consensus. A more measured migration path is emerging as carriers reconsider the infrastructures, test-bed sites, and economic viability of interactive service delivery. Leading the way are AT&T and the RBOCs with their focus on infrastructure buildout, new technologies, modified test beds, and the application of consumer market research in trial territories.

Several approaches emerged in 1995 and will develop further over the next 12 months. Intel and AT&T plan to offer "a package of network and customer premises elements to cable TV and local telephone companies" to enable "a set of viable two-way, interactive PC services." Microsoft envisions "broadcast PC" in a way that any standard PC in the future will have a digital broadcast receiver connected to it (or embedded in it) that would allow it to receive broadcast video plus any data transmitted in conjunction. Does this portend a miniature PC in the TV or, the alternative, a mini TV in the PC? A company called EN Technology is already demonstrating the capability of connecting the TV to the PC for specific applications.

Excluding hardware-only vendors, the current scenario suggests more mergers, with the telephone companies strengthening their positions with their consumer and business accounts through content development and delivery. As this issue goes to press, US West has acquired Continental Cablevision. However, as John O'Farrell, president of U.S. West's Interactive Services Group, explains, "The pursuit of interactive services will be by evolution rather than a revolution." Overall, there needs to be further evidence of a potential for return on investment before the speed of development and delivery quickens.

New technologies offer still more choices and potential confusion for providers. An acceleration of interest is occurring in wireless digital platforms, switched digital video (SDV), and orbiting direct-broadcast satellite networks. AT&T's VideoSpan, which permits video transmission over copper wires, adds further deployment technologies to consider. While the specter of government's role has diminished with the passage of the bill, the reallocation of spectrum auctions looms. To further complicate matters, there is AT&T's self-imposed metamorphosis. Against this chaotic backdrop of events, *The Gray Sheet* provides a synopsis of the latest U.S. developments in the world of interactive trials.

AT&T, the Technology Resource

Although AT&T is a major enabling force in the several video dialtone (VDT) and interactive trials under way, its focus recently has been on other areas, namely wireless, satellite, and global-type networks such as the Internet. AT&T's self-imposed restructuring may cause changes in priority as entry into local markets becomes a reality. In the meantime, some of the highlights of AT&T activities as a major player for provisioning, systems integration, and equipment provider to the various trials are provided here for perspective.

AT&T Microelectronics has developed the first set of integrated circuits able to transmit switched digital video over ordinary phone wire — Chips Platform for Interactive Services over Copper Wire. The company also disclosed that leading vendors that have evaluated samples of the chips agree it is the technology of choice for planned installations around the world. An outgrowth of joint development with BroadBand Technologies, the chips are part of planned system

Bell Atlantic Video Dial-Tone Rate Schedule

	Month-to-Month Rate ($)	5-Year Rate ($)	Nonrecurring Rate ($)
Video DialTone Access Link (Up to 96 6Mbps MPEG2 channels)			
Direct-access connection			
Termination	1,100	900	725
Fixed	600	500	
Per mile	13	12	
Serving wire-center connection			
Fixed	1,200	1,000	410
Per mile	13	12	
Broadcast service			
Per-service agreement			250
Individual broadcast channels per channel per POTS subscriber	0.050	0.045	
Group of 24 broadcast channels per channel per POTS subscriber	1.10	0.90	
Narrowcast service			
Per-service arrangement			400
Individual narrowcast channels per channel per POTS subscriber	0.08	–	
Optional feature (Available with broadcast and narrowcast channels)			
Messaging port	325	–	175

Source: Bell Atlantic and IDC/LINK, 1996

deployments of BroadBand's FLX SDV System by France Telecom and of AT&T Network Systems' SLC 2000 Access with FLX SDV System by Southwestern Bell and Disney's Celebration Community.

Because the platform includes compatible chips for either a set-top terminal or computer interface, the specifications have also won support from such leading interactive terminal providers as Divicom, Philips, Sony, Thomson Consumer Electronics, and Zenith. Known as multipoint broadband access (MBA), this approach breaks new ground in the amount of two-way information that can be carried over installed telephone or TV cables.

By reusing the existing copper wires, service providers can cost-effectively add a new dimension to ordinary telephony with simultaneous interactive video or computer transmission from multiple terminals or televisions in the home. The technical breakthrough allows digital bits of audio, video, or data to travel at a rate of up to 51.84Mbps to the home or office and up to 1.6Mbps back into the network.

The new MBA chips incorporate a standard interface technology that is compatible with asynchronous transfer mode (ATM), a networking protocol that specifies how digital cells containing packets of voice, data, and video are interleaved for transmission over a

common network fabric. The resulting chipset incorporates Bell Laboratories' CAP (carrierless amplitude/phase modulation) technique, which acts like a superfast modem to deliver services; a high-speed return channel for sending information back to the network; and ATM framing and decoding technology that directs incoming and outgoing signals to their proper destinations.

The ATM cell transport designed into the chips means that full-motion, broadcast-quality video (or even high-definition TV) can be simultaneously transmitted with high-speed data to multiple end points in the home or office. Moreover, electronically accessible information can be retrieved from virtually anywhere in the world since it is delivered over the public switched network.

Set-top equipment manufacturers should benefit from the chipset by a reduction in the complexity of the electronics required to connect any combination of up to six TVs, PCs, telemetry, or remote-control systems with the switched network. When designed into both the network termination and set-top equipment, MBA chips harness the intelligence of the switched network to deliver services on demand. By eliminating the electronics used in current–generation set-tops to unscramble desired premium or pay-per-view (PPV) channels, the MBA solution not only reduces the complexity and cost of customer equipment, but also provides a secure signal to each subscriber.

The expected cost-saving attraction of switched digital video technology is its reuse of the existing wiring that delivers today's phone and broadcast cable television services. The SDV architecture allows service providers to add the new digital services as an adjunct to current services over the same transmission facilities.

AT&T's Paradyne Unit introduced a digital transmission technology that operates more than 70 times faster than currently available modems and enables widespread video telephony services over a single copper phone line. The new technology, dubbed the multimedia "modern modem," will send video and other multimedia offerings over the copper phone line, thus complementing other high-speed solutions for accelerated, universal access to new services.

AT&T Bell Laboratories and AT&T Paradyne have codeveloped a new application for its GlobeSpan technology platform that is the first single-line solution to transmitting simultaneous voice and data at a range of speeds up to T1 and E1 (1.544Mbps to 2.048Mbps) in both directions. AT&T Paradyne describes this as SDSL (symmetric digital subscriber line) technology. GlobeSpan is a current solution to providing high-speed access over existing phone lines and complements emerging fiber-based networks. Bidirectional speeds for GlobeSpan SDSL ranges from 128Kbps to E1.

The GlobeSpan chipset enables one common hardware platform to support SDSL, ADSL (asymmetric digital subscriber line), and HDSL (high bit rate, digital subscriber line) applications. GlobeSpan SDSL offers several advantages. Service providers may use SDSL for access to multiple data services, including fractional T1/E1, X.25, frame relay, Internet access, and ISDN. Projected transmission distances will reach more than 17,000 feet (5.1 kilometers) at 384Kbps, including standard telephone service on the same phone line.

When phone service is offered with SDSL, it will not be disrupted by the transmission of data or video, or the loss of customer premises electrical power. Additionally, the cost of SDSL will be less than HDSL because it requires nearly one-half of the transceiver components and only one copper wire phone line.

AT&T, the Technology Partner

AT&T's technology leadership has led to its featured role in several new interactive trials. AT&T and Samsung

US West Trial Services/Arrangements

	Recurring Charge ($)	Nonrecurring Charge ($)
BVDT Gateway Connection		
• Per individual analog and 9QPR connection		
First mile or fraction thereof between the programmer provider's premises and BVDT gateway	150	500
Each additional mile or fraction thereof	20	–
• Per group of up to 16 analog and 9QPR connections		
First mile or fraction thereof between the programmer provider's premises and BVDT gateway	1,500	5,000
Each additional mile or fraction thereof	20	–
• Per 155.52Mbps digital connection		
First mile or fraction thereof between the programmer provider's premises and BVDT gateway	250	500
Each additional mile or fraction thereof	30	–

Notes:
1. BVDT — basic video dial tone
2. 9QPR — 9 quadrature partial response. A network interface that allows/supports bandwidth speeds enabling the transmission of games and similar applications.
3. VBI — vertical blanking interval service — the space within a 6MHz channel that permits scrolling of information at the bottom of the TV screen (horizontal scrolling).

Source: US West and IDC/LINK, 1996

Electronics signed agreements to support the integration of the Microsoft interactive television (MITV) platform in tests and commercial deployments around the world. AT&T and Samsung joined Alcatel SEL AG, Andersen Consulting, Lockheed Missiles & Space, NTT Data Communications Systems, and Olivetti S.D.A. in providing integration support for the MITV broadband network architecture, combining the operating system with a variety of servers, switches, set-top boxes, and network-operation and management software to provide a complete end-to-end system that can be deployed by network operators.

AT&T and Disney agreed to build the High-Tech Community of the Future in Celebration, Florida. Residents of the planned 4,900-acre community being developed by the Celebration Company, a subsidiary of the Walt Disney Company, will soon be cruising an AT&T test track on the information superhighway, participating in a "living laboratory" designed to help understand how people adapt to emerging high-technology products and services.

AT&T and BroadBand have jointly developed a broadband access architecture platform — the SLC-2000 Access System with FLX switched digital video. This product integrates AT&T's SLC-2000 digital system with BroadBand's fiber loop access (FLX) switching and transport technology.

This platform provides unlimited bandwidth for ATM signals and complies with industry standards SONET, ATM, MPEG, and TR-303, providing true service independence. This is the second planned deployment of this switched digital video system for the two companies. Southwestern Bell is also deploying this platform in Richardson, Texas.

Ameritech

Ameritech's initiatives have been dogged by delays. The schedule for interactive trials has moved from the end of 1994 to early 1996. The initial rollout continues to be based on hybrid fiber/coax (HFC), using analog signals, but will migrate to digital. There is no indication yet as to the migration schedule. The Federal Communications Commission approved the two-way video network on December 23, 1994.

Still, the firm continues to move forward with new parnterships. In April 1995, Ameritech formed New Media Enterprises (NME) based in Chicago, Illinois. NME is responsible for delivering video programming to consumers in the Great Lakes region. The cable TV set-top box will be supplied by Scientific-Atlanta. Ameritech's interactive plans also include home grocery shopping and games. Ameritech currently has franchise agreements with Glendale Heights, Illinois, and four communities in suburban Detroit, Michigan: Plymouth, Plymouth Township, Canton Township, and Northville. Discussions are under way with about 30 communities in the Chicago; Detroit; Milwaukee, Wisconsin; and Cleveland and Columbus, Ohio, metropolitan areas. Ameritech's major competitor in the Columbus area is Warner Cable.

Ameritech also formed Americast in April 1995. It is a joint venture with the Walt Disney Company, BellSouth, and SBC Communications to create video programming and interactive services that can be offered via Ameritech's network. GTE joined the venture in August 1995. Each of the partners will fund the project, a total of $500 million over five years. The venture will operate independently, with its own CEO. In addition to local broadcasting stations, Americast's basic package plan includes CNN, ESPN, Nickelodeon, USA, and the Disney Channel.

Ameritech will carry local channels on the interactive network for community and government programming. The plan is to support public, educational, and governmental access through a percentage of Ameritech's gross revenue. The actual percentage would be determined during the franchise approval process. Overall, Ameritech's plan is to reach 6 million homes by 2001.

Bell Atlantic

During 1995, Bell Atlantic concluded its Stargazer video-on-demand market trial in Fairfax County, Virginia. Currently there are an estimated 1,000 subscribers. The Bell Atlantic Video Services (BVS) trial was conducted over HFC, using asymmetrical digital subscriber-line (ADSL) twisted-pair connection for video and telephony. BVS views this trial as a success although specifics are scarce. Viewers paid only for what they used, with prices ranging from 49¢ to $4.49. Remote-control devices were used to select programs on demand. Four major categories were offered, namely, Entertainment, Kids Zone, Learning and Lifestyles, and Marketplace. The trial will be extended through 1996, with an additional 1,000 subscribers.

BVS signed more than 100 programmers to provide movies and television programs. Content included approximately 200 movies; 120 television programs; 45 sports, comedy, and music performance specials; more than 170 special-interest programs; and more than 120 children's programs. Participants included ABC, CBS, NBC, Sony Pictures/Columbia TriStar, Walt Disney, Universal Pictures, MGM/UA, and Paramount.

The FCC approved the nation's first VDT trial for Toms River, located in Dover Township, New Jersey, in June 1995. The trial began in late 1995 and is based on the use of switched digital video. Bell Atlantic has indicated that the economics of SDV provides better price points, greater bandwidth, higher-quality video and sound, and the smooth integration of video, telephony, and interactive capabilities. However, the use of ADSL will continue in some regions, for example Fairfax, Virginia.

Full-scale deployment of SDV is currently targeted for 1997.

Currently seven video information providers (VIPs) have reserved a total of 304 of the 384 channels available. They are FutureVision, Graff Pay-Per-View, International TeleCommerce, Playboy Entertainment Group, Rainbow Programming Holdings, and two others.

Bell Atlantic's VDT full-motion video test started with 200 volunteers in late 1995 and lasted six to eight weeks. Commercial deployment is planned for early 1996 to all 38,000 Dover Township households. Consumer pricing for these programs will be set by each of the seven video providers. TeleTV will not provide programming content on the Toms River service network at this time. Philips Digital Videocommunications Systems, a division of Philips Electronics North America, and Compression Labs have begun volume production and shipment of interactive MPEG-2 digital set-top decoders for use in commercial switched digital networks in Dover Township.

Bell Atlantic will offer VDT channel capacity on a "common-carrier" basis, without discriminating among video information providers. The VIPs would provide programming and other information, including interactive text messages, to their residential and business customers over Bell Atlantic's video dial-tone network.

In July 1995 Tele-TV launched the Core Advertiser Program. Tele-TV, the new media joint venture of Bell Atlantic, NYNEX, and Pacific Telesis, announced it has signed up Nissan Motor Corporation U.S.A. and VISA U.S.A. to be the first two of 12 advertisers in its Core Advertiser Program. The Core Advertiser Program will allow advertisers to begin measuring customer reaction to a full range of interactive advertising delivered over the wired and wireless networks in six of the nation's top seven markets.

For a fee of $125,000, advertisers participating in the Core Advertiser Program will obtain more than just space on a server. Fifty thousand dollars is immediately set aside for the development of an interactive prototype. Participants will also obtain immediate measurements of viewing behavior and a wealth of experience with precisely targeted advertising.

In September 1995 Tele-TV Systems announced the selection of Thomson Consumer Electronics to supply the TV set-tops and systems to be used in the delivery of video entertainment to up to 3 million homes, via multichannel multipoint distribution systems (MMDS), or wireless cable, pending finalization of a definitive agreement. The total value of the contract is more than $1 billion over the course of three years, with a per-set-top cost of less than $400.

US West

During 1995, US West went through a number of changes in its approach toward the evolution of its own interactive trials. In May, US West asked the FCC to suspend review of its interactive network plans until its market trial in Omaha, Nebraska, was completed. The US Avenue trial met its demise in August 1995 when it was canceled because of slower-than-anticipated deployment of broadband networks in addition to the high cost and complexity of developing a fully functional transaction-based service.

US Avenue is symbolic of the dilemma faced by all of the players in interactive trials: what should be offered over traditional TV as opposed to the PC. Compounding the complexity is the rapidly changing technology platforms. In September, US West formed a new organization within the US West Media Group, namely, the Interactive Services Group (ISG), with John O'Farrell appointed as president. The ISG will oversee On-Line Services, Television Services, Interactive Video Enterprises, and GOtv.

Summary of VDT/Interactive Trials

Carrier	Participants	Technology	Location	Timing	Subscribers	Content
AT&T	AT&T, broadband, Celebration Co. of Walt Disney Co.	Switched Digital Video (SDV); AT&T's SLC 2000 and broadband FLX switching technology	Celebration, Florida – a planned 4,900-acre community	Not announced yet	N/A	Trial to test how people adapt to new technology products and services
Ameritech	NME – New Media Enterprises, Scientific-Atlanta, Americast venture	Initial rollout – HFC using analog–signals planned migration to digital	Great Lakes region; franchise agreements w/ Glendale Heights, IL and 4 communities in suburban Detroit, MI	Interactive trails postponed from end of 1994 to early 1996	Target 6 million homes by 2001	Video programming, plans for home grocery shopping, games, community and government programs
Bell Atlantic	100 programmers to provide movies and tv programs, ABC, NBC, CBS Sony Pictures, Walt Disney, MGM, Paramount, etc.	HFC, using ADSL twisted-pair connection for video and telephony	Fairfax, VA	Fairfax trial concluded. Plan to extend trial period through end of 1996	Currently 1,000 subscribers; additional 1,000 subscribers planned through 1996	4 categories: Entertainment, Kids Zone, Learning and Lifestyles, Marketplace, Pay as You Go. $0.49–$4.49 per movie/game
Bell Atlantic	Philips Digital Videocomm. Systems and Compression Labs	Switched Digital Video	Dover Township, NJ	Late 1995 start-up; full-scale deployment of SDV – 1997	200 volunteers – 6–8 weeks start-up; commercial deployment in Dover to 38,000 homes in early 1996	384 channels available; currently 304 channels reserved
US West	Scientific-Atlanta, 3DO, Digital, New Century Comm., CSG, AT&T, Interface Comm. Group	Video dial-tone trial; digital-based interactive services	Omaha, NE	August 1995 start-up; As of 9/95 penetration of 3,000 subscribers (6% of targeted market)	Target 50,000 homes	Analog and premium CATV programming; GOtv interactive entertainment; TeleChoice product line
BellSouth	HP – MediaStream interactive video servers, Sybase – Intermedia products; Scientific-Atlanta, Cabledata	VDT network, HFC system	Chamblee, GA	Mid-1995 start-up delayed to early 1996; planned 18-month trial	Target 12,000 homes	70 analog channels for cable, VOD, interactive games, home shopping, electronic banking, messaging
Pacific Bell	AT&T, Scientific-Atlanta, HP, Nortel	Hybrid fiber coax	San Jose, CA	Targeted to start 4Q95 with 200 subscribers	Target 50,000 homes	Interactive services: VOD, TV shows on demand, news, tele-education, home shopping, video games, community info
TCI/ Microsoft	Compaq-server, set top; Fore – ATM; HP – network adm., Sun Tech – billing services, definitive audio – audio/video system	Microsoft interactive broadband sw with a fiber-to-the-node/ATM transport environment	Redmond, Washington, to be extended to Seattle	200 TCI/ Microsoft employees currently using system – started 1Q95	Plan to expand by 4Q95 to 2,000 subscribers in greater Seattle	1995 services – EPG, VOD, games, advertising, catalog shopping, TCI service channel; 2Q96 – music, sports on demand

Summary of VDT/Interactive Trials — Continued

Carrier	Participants	Technology	Location	Timing	Subscribers	Content
Time Warner	AT&T, SGI, HP, Hitachi, Scientific-Atlanta, Toshiba, Logitech, ISD, IDS, Sybase, etc.	Digital fiber/coax network	Orlando, FL	700 households currently using system; trial started 4Q94	Target 3,500 homes by YE95	VOD, interactive shopping and program guide, games, Carousel navigator; new services: news on demand, fast-food delivery
GTE	AT&T, General Instruments	VDT network in Florida, planning an HFC architecture with ATM switches for Ventura County, CA	Began in Florida and California; New targets – St. Petersburg, Clearwater, FL, began 7/95, and Ventura County, CA late 1995	Initial trials conducted 1991–1994; targeting 232,000 homes in St. Petersburg, Clearwater Fl.; 83,000 homes in Ventura County, CA	Target 500,000 homes – 1996; 1 million – YE97, 7 million homes in 66 markets – 2004	Target – 248 channels of broadcast and cable programming, basic and premium, PPV, GTE MainStreet – targeting over 100 services
BellSouth	Same providers as above	500 home-node HFC system 550MHz capacity expandable 70 750MHz interactive network	Daniel Island, SC	Target early 1996	Target 7,000 homes	Similar programming to above trial in Georgia
Frontier Corp.	USA Video	VDT network	Rochester, NY	Conducted during 1994; Canceled trial after 4 months, VOD not considered economically viable without banking/shopping	52 customers signed up	Services included VOD, music on demand; pricing was from 49¢ – $3; very limited interactive ability; no transactional capability
SNET	AT&T; American Lightwave Systems; HP; Sybase; Scientific-Atlanta	HFC network with analog video dial-tone services	Hartford and Fairfield, CT	Began trial in April 1994 offering VDT to 1,250 homes in West Hartford, CT	Currently offers VDT to 350 homes in West Hartford, plans to offer to 150,000 homes in 1996	50 broadcast channels, enhanced PPV, 1,700 titles for near VOD ranging from 50¢ to $3.95
Nynex	Vendors for the new trial not yet announced	Fiber-to-the-curb to carry ADSL and SDV technologies	Manhattan	Completed VDT trial in Manhattan in 07/95	Starting advanced digital video services in Manhattan in 1996 to 800 customers	Trial will include only interactive services including home shopping, learning applications

Source: IDC/LINK, 1996

In August 1995, US West Communications started its 12-month VDT network market test of multimedia services, known as US West TeleChoice, to nearly 50,000 households in the Omaha, Nebraska, area. More than 3,000 subscribers have signed up, or 6% of the targeted market, according to a company spokesperson.

US West TeleChoice features analog-based basic and premium cable television programming. It will also include

GOtv, an interactive entertainment service from US West ISG. During the trial, the company plans to add digital-based interactive services to its TeleChoice product line that offers movies on demand, electronic "navigator" screens, home shopping, games, and other applications such as distance learning and telemedicine.

All TeleChoice video channels can be delivered directly to cable-ready TVs and VCRs without the need for an additional cable box. Other participants in the trial include Scientific-Atlanta, the 3DO Company, Digital Equipment, New Century Communications, CSG, and AT&T. Interface Communications Group will provide the video programming using US West's video gateway. Interface Communications will retain sole responsibility for channel selection and determine the pricing and packaging of services. US West serves as the network carrier and leases the network to content providers.

TV Guide will publish its first edition of the magazine, which has been custom designed to accommodate distribution of video programming over the Telechoice network. As part of its basic package, Telechoice subscribers will receive *TV Guide* each week at no additional charge.

GOtv: US West, *Orlando Sentinel* Plan Interactive TV Guide

US West Interactive Services Group and the *Orlando Sentinel* will launch an interactive entertainment guide called GOtv in November 1995. Customers of Time Warner's Full Service Network will have access to previews of movies playing at local theaters, along with videotaped reviews of the movies by the *Sentinel's* movie critic. As the project expands, it will include guides to local restaurants and theme parks as well as other local entertainment attractions. The *Sentinel* will provide content including local news and classified advertising, consumer and commercial services, and community-based content starting in 1996.

GOtv will also include interactive advertising. Viewers can select the advertising messages of interest by clicking an on-screen icon that will deliver detailed product information. Visa is the first national advertiser to participate in the trial. GOtv appears to be a simplified version of US Avenue in that there are fewer merchants, manageable transaction levels, and fulfillment probes.

Pacific Bell

Pacific Bell will begin its first VOD trial in San Jose, California, in the fourth quarter of 1995. The plan is to attract up to 200 subscribers. Commercial offerings are planned for the first quarter of 1996 in San Jose and San Diego, California, based on the results of the trial. The interactive services slated to be offered toward the end of the trial include movies and television shows on demand, interactive news, tele-education, home shopping, video games, and community information listings.

AT&T is providing construction and provisioning requirements for the network buildout. Scientific-Atlanta will supply the set-top box and Hewlett-Packard the video servers. Nortel will provide SONET capability as part of the network backbone. AT&T and Scientific-Atlanta will also provide network system integration services.

The pricing approach to this network is similar to Bell Atlantic, namely a common-carrier approach via tariff rates. These rates are in the formulation process for submittal to the FCC. The VIPs will lease the network from Pacific Bell and set consumer pricing individually. The lead programmer is Anchor Pacific Corporation. Another company, California Standard Television Corporation, will supply programming on channels reserved for broadcast programming.

Pacific Bell has elected to base its full-service network on hybrid fiber/coax. There are no stated plans to use either ADSL or SDV technology. The company has indicated, after thorough review, that HFC is the right choice based on costs, reliability, capacity, quality, and efficiency. The services planned span basic telephony, broadcast analog and digital video, digital interactive, video on demand, multimedia services video telephony, interactive games, Internet access, data and ISDN services, and wide area networking.

In April 1995, Pacific Bell announced plans to acquire Cross Country Wireless for $175 million to propel its entry into wireless television delivery. Cross Country Wireless has an estimated 42,000 subscribers in California and provides 30 video channels. In August 1995, the company added new participants to its technology test of Media Park, a broadband communications network. Media Park is a "virtual production studio" for the entertainment, marketing, and multimedia industries. The new members are San Francisco State University, Drew University of Medicine and Science, HOB (House of Blues) Entertainment, Canter Technology, Delphi International, SynergyLabs, Virtual Movie, Web Storm, and Winsonic Technologies.

GTE

While the deployment of GTE Telephone Operations' video dial-tone network is proceeding in both Florida and California, the final form of the services to be provided remains unresolved. GTE is forging ahead with establishing the infrastructure of its network, but is waiting for the FCC to clarify whether existing telecoms will have to abide by Title 6 or Title 2 rules before establishing its services package. Once this decision has been made, GTE expects to begin service delivery in the spring of 1996.

Efforts to build an interactive video trial in Manassas, Virginia, which was to begin in 1995, were disbanded early in the year after partner AT&T Network Systems stated it believed that the level of technology to be tested in the trial was already outdated. Although the company-approved 214 filing for the Virginia site remains valid, GTE has backed off plans to develop it for now. The company has also deferred development of its Honolulu site due to the prohibitive costs of capital that result from a downgraded bond rating.

Based on its earlier video trials from 1991 to 1994 in Cerritos, California, GTE is now deploying an interactive-capable VDT network in both Florida and California and has plans to extend the network to several sites across the nation. Construction in the St. Petersburg/Clearwater, Florida, market began in July 1995 and will initially pass 232,000 homes; the Ventura County, California, site development is anticipated to begin in late 1995 with plans to pass 83,000 homes. Plans for the current two sites target 500,000 passed homes in 1996 and one million by the end of 1997. If the initial phase is successful, GTE expects to reach seven million homes in 66 markets by the year 2004.

The network that is currently being built will serve 500 home nodes using GTE's hybrid fiber-optic (which have a minimum of six fibers) and coaxial cables. AT&T Network System will provide the equipment for system integration and will include an interactive video server, ATM switches, and a fiber/coaxial video transport system. The head-end and fiber-node equipment, coaxial amplifiers, and set-top boxes (hybrid analog and digital) are supplied by General Instrument. The system will debut AT&T's MPEG-2 video encoders, and the coaxial cables to the home will deliver both analog and high-capacity digital services to General Instrument's set-top boxes. The cost of the project is estimated to be $500 to $700 per subscriber, and AT&T and General Instrument are signed to a combined $200 million contract.

Although the final package and pricing of services to be delivered depend on the outcome of the Chapter 2 versus

Chapter 6 decision, the network will be capable of delivering up to 248 channels of broadcast and cable programming, basic and premium tier cable services, pay-per-view events, and some interactivity. US West has scrapped its plans to offer US Avenue because of the difficulties of dealing with several large retailers; however, GTE is moving forward with its interactive shopping service, GTE MainStreet, which it will incorporate as the interactive portion of the emerging network.

GTE MainStreet will eventually provide more than 100 services that will include home shopping, educational programming, multiplayer games, and information services. Additional interactive services will be added to the initial package as ATM switching capabilities expand, particularly in the 1997 to 1998 time frame. In addition, a joint venture with the Walt Disney Company has been established to assist with the development of video programming and interactive services.

BellSouth

BellSouth originally planned to begin its interactive video services trial in Chamblee, Georgia, in mid-1995, but the rollout has been slower than expected due to the ongoing evolution of technological, financial, and regulatory issues. The 12,000-home HFC video dial-tone trial is now set to begin in early 1996 and will run for 18 months. The trial is primarily intended to test the technical requirements of an interactive system, but future commitment to service delivery will be based on these results as well as an assessment of demand as this paying trial progresses.

Five primary suppliers are involved in the project. Hewlett–Packard will supply MediaStream interactive video servers that are scalable, open, and modular to allow for future growth. Sybase Intermedia products will author, deliver, and manage the interactive consumer services capabilities for the network. Intermedia Server (based on Sybase's SQL Server RDBMS technology) will provide control and message integration on top of HP's MediaStream Server. Sybase was able to gain the contract after disagreements between BellSouth and the original software supplier, Oracle, emerged.

The problems derived primarily from pricing and deadline decisions. However, Oracle will still participate by providing the transaction processing needs for the service. PowerTV set-top operating systems will be provided by Scientific-Atlanta and will use Sybase's Gain Interplay to integrate both analog and digital signals in the home. CableData's Intelecable system will provide operational support, including support processing, collections, charging and billing, field communications, marketing, and financial reporting.

BellSouth expects to spend a total of $30 million to build the trial network. With a 750MHz capacity, the network will support 70 analog channels, with 6MHz each, and a remaining capacity that will handle roughly 240 channels. Given a start date that has been postponed until early 1996, the technology to be used in the trial is in ongoing development and each supplier for the network still needs to fully develop the software capabilities needed to manage the system.

Service providers have not yet been announced, but the services will initially roll out 70 analog channels for cable services, movies on demand, and high-speed access to personal computer services. In addition, the trial will include a phased deployment for other digital interactive services as they become technologically feasible. Potential services to be investigated include interactive video games, home shopping, electronic banking, and messaging.

The system architecture will include cable modem connections, using the same wire to the home, to facilitate improved connections for PC services. Though 12,000 homes will be passed, the number of participants will depend on the market's acceptance of service pricing. In turn, pricing is dependent on the service package, which is still to be determined. Although services have

not yet begun, the Chamblee trial is already responsible for a few lessons for BellSouth's commercial ventures.

The company has found itself caught between the need to offer channel access to interested programmers under its video dial-tone status and the bandwidth limitations of the hybrid fiber/coax system. Despite the high capacity of the network, programmer demand still outstrips its channel capabilities. Other technological and regulatory issues also bring into question the economic and financial viability of video dial-tone service.

In turn, BellSouth opted to bypass Title 2 common-carrier rules and filed a 214 application with the FCC in July 1995 to establish Daniel Island Cable as a franchised subsidiary under Title 6 rules. Daniel Island, South Carolina, meets the FCC's definition of rural property, which is exempt from the cable/telco cross-ownership ban under Title 6.

The plans outlined for the new location include both cable TV and telephony services for 7,000 homes by early 1996. The video portion of the network will consist of a 500-home-node HFC system, which will begin with a 550MHz capacity, but will be expandable to a 750MHz interactive network. Amplifiers and repeaters will be spaced to accommodate interactive services to be provided in the future. A separate fiber-to-the-curb network with optical network units that serve six to ten homes each will deliver telephony services. By establishing parallel systems, BellSouth hopes to avoid potential regulatory hassles in the future.

Frontier Corporation

Frontier (formerly Rochester Telephone) abandoned its video dial–tone trials after only four months, even though the FCC had approved the trial for another six months. Approximately $1 million was invested in the venture with USA Video with about $270,000 expended on the trial. Although the company will continue to investigate new opportunities in video and information services, Frontier has stated it no longer has plans to develop video-on-demand services.

Rochester Telephone and partner USA Video discovered that although interactive video services are technologically plausible (despite having some glitches early in the trial), they are not economically viable as a standalone product. However, the FCC did not allow the trial to expand beyond one apartment complex, a situation that limited the demographics of the test base.

Although customers found the interactive services to be intriguing, they were not prepared to assume greater costs necessary for additional services. Rochester Telephone noted that VOD will need to be integrated with other services such as banking and shopping to increase the economic viability of the interactive delivery. The test was conducted with 52 customers and included movie and music videos on demand (ranging from 49¢ to $3.99 per video) and limited interactive capabilities, including games and home shopping (without transaction capabilities). Customers in the trial showed interest in digital interactive services beyond videos on demand.

SNET

Southern New England Telephone (SNET) initiated its interactive video trial in April 1994 by offering video dial-tone services to 1,250 homes in West Hartford, Connecticut. The ongoing trial has gained 350 subscribers and offers traditional broadcast and premium channels, enhanced PPV, and near-VOD analog services.

The company is currently waiting for FCC approval to expand the VDT trial to an additional 150,000 homes in Hartford and Fairfield counties. Although SNET is broadening the trial's geographic base, its technological expansion plans have been tempered from a year ago when it stated a commitment to develop a digital network capable of handling 200 channels that would

serve 500,000 homes on a commercial basis by 1997. Fiber optics currently make up only 5% of SNET's network, but they will be tested as part of the expanded trial, which will include digital channels in approximately 30,000 homes.

The current trial network, as well as the proposed expansion, is an HFC network providing analog video dial-tone services. The components of the system include Hewlett-Packard's MediaStream Server, which utilizes HP's video-transfer engine technology designed specifically for VOD delivery, and Sybase Intermedia, combined with System 10 relational database products, to control the application content and transaction management. Scientific-Atlanta is supplying analog and digital home set-top boxes, including its advanced analog 8600X system, as well as analog and digital head-end equipment.

AT&T Network Systems' ATM technology is used to switch video streams among the serving central offices, and ADC Telecommunications' subsidiary, American Lightwave Systems, will supply digital transport technology to carry broadcast services. Software incorporated into the system includes Gain Momentum, to be used by SNET to author multimedia applications; Gain Interplay, for the set-top operating system; and Intermedia Server, to manage the video servers.

Under its VDT status, SNET has agreements with several providers, but primarily obtains its service from Connecticut Choice Television, a subsidiary of CAI Wireless Systems. The relationship has raised some concern among cable-industry competitors, which have argued that SNET's control of program packaging, pricing, and other business decisions extends beyond the power it should hold as a common carrier. The FCC has stepped in to examine the SNET–CCT contract, which covers the supply of both the basic broadcast and the premium channels to the trial.

The trial's current services include 50 broadcast channels, enhanced PPV with 18 recently released movies available every half hour, and 1,700 titles for near-VOD; the titles range in price from 50¢ to $3.95. Basic services are priced competitively with existing cable services, and incremental charges are assessed for additional interactive services. The company feels that the positive reaction it has received from existing customers offers encouragement for the expansion of the trial.

No current plans exist to add home shopping, education, health care services, or 200 digital channels as originally intended. These potential digital services have been placed on hold for at least another year as SNET considers technology advances and market demand. The company has conducted lab tests for digital services, but currently has no plans to conduct field tests given a belief that digital capabilities are not well established and are not yet commercially viable. In the meantime, SNET is committed to providing video dial-tone services and will carefully consider any new FCC rulings.

To competitively position itself for future information delivery services, SNET is investing $4.5 billion in I-SNET, a hybrid fiber-optic/coaxial cable network that will be capable of supplying both telephony and interactive video services. The statewide network is planned to be completed by 2009.

The first portion of this full-service network was activated in Stamford, Connecticut, on October 30, 1995, making it the first telephone service to be offered over an HFC network. Current services are limited to telephone delivery, but the network can be adapted for interactive video services in the future. The network is based on AT&T's Network Systems' HFC-2000 broadband access system, and fiber cables provide the backbone while coaxial cables provide distribution closer to the subscriber's location.

NYNEX Entertainment and Information Services

NYNEX concluded the first trial of its VDT system in Manhattan in July 1995 and plans to conduct a new trial of an advanced digital technology system in 1996. The initial analog trial, which began in January 1994, included 50 customers and provided broadband cable interactive services that included true VOD and full VCR capabilities. The goal of this first trial was to gain technical experience for managing an HFC system.

A second trial, due to begin in 1996, will deliver advanced digital video services to apartment buildings in Manhattan. This trial will include only interactive services, such as interactive information services, home shopping, learning applications, and games and is planned to reach 800 customers.

The fiber-to-the-curb (FTTC) design will carry asymmetrical digital subscriber lines and switched digital video technologies. Twisted-pair cable wires will serve both video and telephony signals. Vendors for the new trial have not yet been selected.

The NYNEX Entertainment and Information Services Group is managing all strategic alliances with service providers, including Viacom, Tele-TV, and CAI Wireless.

NYNEX has also been approved by the FCC to build commercial video dial-tone systems that will pass 334,000 homes in eastern Massachusetts and 63,000 homes in Rhode Island. The network is expected to include 21 analog channels and 400 to 800 digital channels.

Interactive Television Trials

The promise of the television as an interactive gateway into the home has fueled investment by IT suppliers in the segment of the market known as interactive television. Beginning in 1995 and continuing through 1996, high-profile trials have emerged. Two stand out: TCI/Microsoft and Time Warner. TCI and Microsoft are testing the waters via the TCI/Microsoft Interactive TV Pilot. Initial technology testing began in Redmond, Washington, with approximately 200 TCI and Microsoft employees.

The test platform consists of Microsoft's interactive broadband software in a fiber-to-the-node/ATM transport environment. Microsoft is providing the network software solutions and all systems integration activities. TCI is supplying the movie content, application design, and network architecture, and it comanages market research as well.

The companies expanded the test to 2,000 TCI residential customers in the greater Seattle, Washington, area during the second half of 1995. Primary research is being conducted with participating homes to understand how they use their current entertainment and information options. The services available include EPG, movies and TV on demand, games, advertising, catalog shopping, and the TCI service channel. A second group of services that will include music and sports on demand and a broader choice of retailers is planned in the second quarter of 1996.

Amid great fanfare, Time Warner began its Orlando trial. However, since the launch, the silence has been deafening. Time Warner has released few details about the results to date. According to the company, services are currently being provided to more than 700 households, and the goal is to have another 3,500 by the end of 1995. Household connections in Orlando are free of charge, and subscribers pay only for services used. The services currently offered include VOD, interactive shopping, an interactive program guide, interactive games, and the Carousel navigator. The Carousel is a three-dimensional graphic interface and the viewer's gateway to access for all full-service network (FSN) venues.

The Interactive TV Conundrum: Melding Attractive Price Points with Sustainable Profits

Time Warner, with the much-hyped test of its Full Service Network in Orlando, and TCI/Microsoft, in the Seattle test, expect that consumers will pay an extra $50 per month for advanced television services such as customized news programs, movies on demand, and educational videos. Early returns indicate that these fees may simply be too high. Not only might customers balk at this figure, but also, executives admit, it still won't be enough for these companies to break even on their investment anytime soon.

At the present time, several cable and telephone companies are concentrating their interactive TV experiments in ultra-high-income communities such as Fairfax County in Virginia, where Bell Atlantic has been recruiting 1,000 households. The TCI/Microsoft targeted audience profile in the Seattle trial consists of households with a median income of $43,000, average household size of 2.65, and a median age of 36.

But such tests will not necessarily provide good indications of the larger TV-watching public. Television viewership varies inversely with household income. According to trend data from IDC/LINK's *1995 Home Media Consumer Survey*, 14% of households with incomes lower than $25,000 report watching 50 or more hours of TV per week compared with 7% of households with incomes over $60,000.

In other words, the people who are most interested in TV are the ones with the least disposable cash to spend on these new digital services. Moreover, IDC research indicates that low-income households may be the least interested in subscribing to these new services. They are typically drawn to a passive form of entertainment as opposed to a more interactive medium.

To increase potential revenue, the companies pushing interactive TV are thus counting heavily on advertising to turn a profit. The idea is for central computers in the cable control room to gather demographic and viewing information about subscribers and provide aggregated lists to marketers. Bell Atlantic, for instance, believes people will use their remotes to call up additional information on new products and services that are specifically targeted to those viewers.

However, such advertising depends on viewers' willingness — not yet demonstrated — to sell off their privacy in return for cheaper programming by participating in what are essentially direct-marketing campaigns.

Results of the Time Warner trials in Orlando further indicate that one of the most popular home-shopping carousel selections is the option to purchase stamps and have them delivered to the home. Focus-group research conducted from IDC supports findings that home shopping will be lucrative primarily for the most basic and mundane of shopping excursions.

Grocery items, cosmetics, and other basic necessities are key targets for home-shopping networks. More sophisticated purchases involving clothes, jewelry, and other personal items are things consumers may enjoy viewing on the screen, but prefer to buy in person. Consumers not only enjoy the socialization experience of going out to shop, but feel the need to see and touch the items that are to be purchased, especially expensive ones.

Reasonable pricing and an easy-to-use interactive interface are fundamental ingredients for success in promoting these services. Hardware and software designers must seriously consider how different age groups will use the system for different purposes, be it for entertainment, information access, or educational pursuits. The ability to perform basic tasks with greater efficiency may prove to be one of the key drivers in the evolution of interactive service delivery.

THE GRAY SHEET
Computer Industry
REPORT

Global market intelligence on the information technology industry since 1964.

Western European IT Markets in 1996: Poised for More Growth?

The Western European market for information technology (IT) products and services appears to be expanding smoothly after experiencing a second consecutive year of solid growth in 1995 led by strong increases in spending on networks, PCs, and client/server technology. Spending totaled $158.8 billion, a 7.9% increase over 1994.

April 15, 1996 IDC #11225 Vol. 31, No. 4-5

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Despite this continued emergence from the doldrums of the early 1990s, Europe's overall portion of worldwide IT spending slid from 28.4% in 1994 to 27.9% in 1995. U.S. spending grew by a blistering 12.0%, to $212.2 billion, and Asia/Pacific and ROW markets by 11.2%, to $158.2 billion.

Overall European growth, which lagged only slightly behind that of the United States, was driven by robust spending growth in Germany and the United Kingdom. In addition, almost all Western European country markets experienced solid growth in 1995 in several broad industry segments, including PCs, networking, and client/server technology.

Based on this increasingly solid foundation, IDC expects to see continued growth — again at approximately 7.9% over 1995 levels — in Western European IT markets in 1996. Among the key technologies and country markets:

- **The United Kingdom** — As the British economy expands, so grows spending on IT — at more than 8% in 1995 from 1994. U.K. growth was led by very strong sales of PCs, particularly home PC equipment, and on a wave of new outsourcing contracts. The trend has continued in the first months of 1996, with strong PC sales reported and several large outsourcing deals.

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- **Germany** — Europe's largest IT market grew by 7.4% in 1995, paced by strong expansion in PCs, packaged software, and professional services. Overall performance in 1996 may be held down by flattening PC sales. Shipments of home PCs in Germany have shown softness in early 1996, with German vendors already feeling the pinch.
- **LANs and the Internet** — Not surprisingly, all countries experienced strong demand for Internet-related hardware and software. Growth through 1996 is expected to at least equal that of 1995.
- **PC sales surge** — All Western European countries saw strong PC shipment growth in 1995, contributing to an overall growth of more than 16%. Sales of home PCs in Western Europe grew less evenly, and home markets in France and Italy were far less robust than in the United Kingdom, Germany, and the Nordic countries. These laggards may contribute to expansion in 1996.
- **Client/server systems** — Sales of client/server tools, applications, and hardware systems expanded across almost all Western European countries in 1995. Despite falling prices, this trend will continue in 1996; one bellwether, network services, is expected to surge by more than 15% in 1996.

How safe is this bullish outlook? Considering the variety of political, economic, technology, and social factors that will define IT market growth, it is remarkably safe. Western Europe's diversity nearly assures that the very strong and very poor performers will moderate overall movement. Since the largest countries, which account for more than two-thirds of total spending, are all headed in the right direction, the momentum is inexorable.

The Western European IT market's near-term fortunes rest on a variety of interrelated factors: economic growth, major government financial restructuring, business confidence, the continued emergence of consumer markets, and the continued development of telecommunications infrastructure, among others. Perhaps the greatest boost to IT spending could be the proposed currency union that would radically alter the continent's financial control and coordination and spur massive spending on IT.

Forecasting country markets that range from the leading edge to the near developing is difficult, particularly amid the patchwork quilt of dozens of individual languages and cultures. This diversity makes Europe perhaps the most difficult regional market worldwide in which to develop and sustain market share and profitability. It is also an engine driving regional opportunity.

Confidence Building After Two Strong Years

Growth in the Western European IT market is now at its strongest in five years since the huge growth rates of the late 1980s. Europe IT markets languished for much of the early 1990s, but turned around mid-decade.

Although a return to double-digit growth remains unlikely, overall confidence is high, and growth is coming from a broad cross section of geographic and technology market segments.

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IT Spending by Country Is Mixed

Strong economic growth in most of northern Europe has been reflected in high growth rates in the IT markets of Scandinavia, the United Kingdom, Ireland, Germany, and the Netherlands. No clear-cut correlation can be determined, however, between real GDP growth rates and the strength of the IT market. Sweden and Germany both have experienced below-average real GDP growth rates for 1995, yet the IT markets in both countries are showing exceptional expansion.

Germany: a Return to IT Investments

The German IT market in 1995 benefited from an upturn in demand as companies began to make investments that had been postponed during the recession. The German IT market grew by 7.4% in 1995.

PC sales dominated the German hardware market in 1995, growing rapidly over 1994. The shift toward the adoption of faster systems and a vendor price war contributed to the growth. Falling prices, technology improvements, and high-quality PCs increasingly drew buyers from the home market.

Sales of client/server applications contributed to the strong growth of the packaged software market. Relational databases and packages catering to specific vertical markets were among the fastest-growing software segments. Growth in professional services was also above the European average.

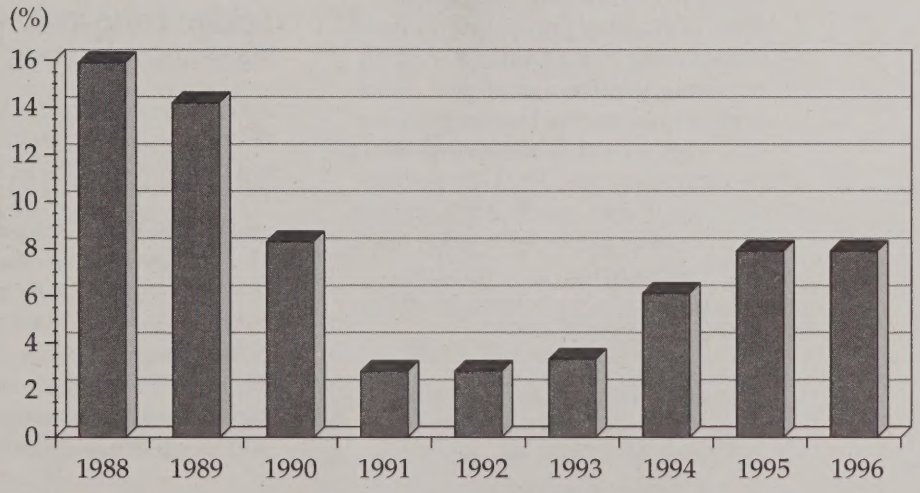
France: Toward Recovery

The French IT market started to come back to life in 1995. However, it recorded only a modest 5.4% growth and for the third consecutive year continued to be among the weakest in Europe. The French IT market is expected to build momentum in 1996 with a forecasted growth of 6.4%.

Soft sales of PCs to homes hurt overall growth. PC sales to other sectors were strong, but the French home PC market started to emerge only at the end of 1995.

Client/server and business-process reengineering (BPR) had a strong impact on organizations. Many large companies that wanted to change information systems also started to change their organizational setup.

Annual Nominal Growth in Western European IT Spending, 1988–1996



Source: International Data Corporation, 1996

In the professional services market, France underperformed because of the ongoing adjustment to a more packaged, software-friendly environment among many organizations. A general decline in government expenditures also had a negative effect.

The one area of optimism is the relatively forward-thinking attitude of the French to the idea of outsourcing, and this attitude is causing double-digit growth forecasts for 1996 and beyond.

United Kingdom: Fastest Grower

The U.K. IT market continued to outperform the total European market with 8.9% expansion in 1995, performing far better than expectations at the beginning of the year. Growth is expected to moderate toward the European average in 1996, with an expected 7.4% increase. One result of strong U.K. growth was that the gap between the size of the No. 2 and No. 3 WE IT markets of the United Kingdom and France narrowed.

For the past three years, the United Kingdom has experienced strong economic growth compared to much of Europe. The IT sector has been a primary beneficiary. Growth in the hardware sector has been driven primarily by sales of PCs and printers.

The U.K. outsourcing market leads those of all other European countries. Outsourcing in the United Kingdom remains a relatively small part of the professional-service market total, but very high growth rates are expected in the next few years. The U.K. government has driven much of this growth as it pushes a policy of "market testing" to ensure that government departments achieve the cost-effective provision of services.

Italy: Recovery Strengthens

Following a modest 2.1% expansion in 1994, Italian IT market growth doubled with an increase of 5.0% in 1995. Nonetheless, this growth remains slightly below average European growth.

Growth in the PC market was particularly strong, for primarily economic reasons. Fundamental market drivers, such as GDP growth and increases in capital spending, are growing at a faster rate than previously expected. The minor rally of the lira on the currency markets helped the Italian PC market in the second half of 1995. The country is now starting to invest in top-of-the-range machines, but a considerable lag still exists between Italy and most of northern Europe.

In the software and services sectors, IT consulting and outsourcing are forecast to expand quickly. Following the trends of the United Kingdom and the Nordic countries, the Italian services market is expected to benefit from the increasing shift of internal IT spending toward external suppliers.

Growth expectations for 1996 are high, with an anticipated 6.5% increase, and in 1997, at 7.4%. Growing faster than the European average, the Italian IT market is expected to catch up on its new-technology adoption over the next two years.

Spain: Long-Delayed Recovery in 1995

After three consecutive years of depression and stagnation (IT spending changes of -1.2% in 1992, -5.2% in 1993, and 1.2% in 1994), Spain's IT market grew by a robust 7.4% in 1995. This still emphasizes that the Spanish IT recovery, like the Spanish economic recovery, is some 18 months or more behind most of Europe. Further catching up is forecast for next year when higher-than European average growth will take place (8.7%) in Spain.

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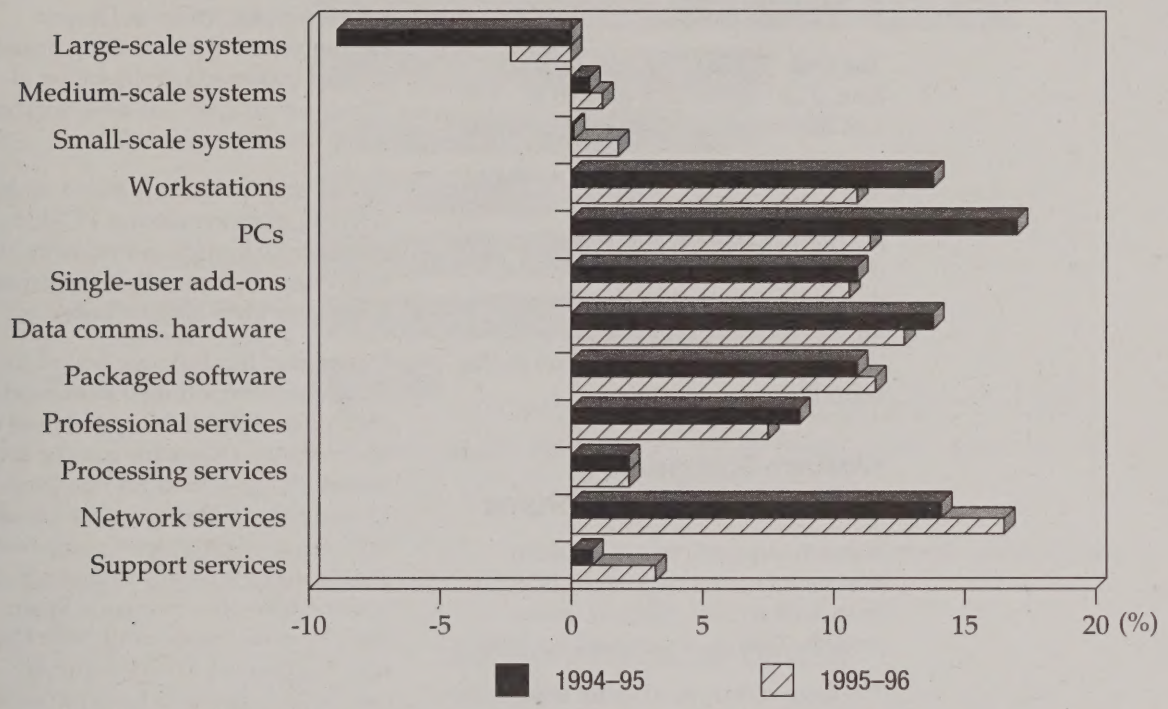
Western European Nominal IT Growth by Market Segment, 1994–1995, and 1995–1996



Source: International Data Corporation, 1996

Despite political uncertainty and Western Europe's highest rate of unemployment, Spain is emerging from its recession. The country expects to receive ECU3.8 billion from EU structural and agricultural funds in 1995 and 3% real GDP growth this year, which is expected to be in line with the European average.

Investment is now driving economic growth, underpinned by a recovery in services and the much healthier financial situation of Spanish companies following the 1992/93 corporate restructuring.

With a population of 40 million, Spain should be one of the larger IT markets in Western Europe. However, the Dutch (with a population of only 15 million), Swiss (7 million), and Swedish (9 million) IT markets are all larger than that of Spain.

The fall in PC sales in 1994 gave way to almost double-digit growth in 1995 with a more substantial improvement anticipated for 1996 and 1997. Falling prices of top-range PCs are driving the upturn. Although the performance of the hardware and software markets is expected to improve in 1995 and 1996, professional service growth will be more difficult to achieve.

Other Countries

In 1995, the Nordic IT markets continued to outperform the European market as a whole, with Finland and Sweden driving growth at double-digit rates. PC and LAN hardware markets were particularly strong.

The Dutch IT market recorded impressive expansion in 1995. By contrast, the Belgian IT market was depressed. The Swiss market achieved average growth in 1995, which will be maintained in

1996. Continuing its catching up process, the Austrian market outperformed the European average in 1995, and the pace of growth is expected to be sustained in 1996.

The Irish IT market showed reasonable, if unspectacular, growth in 1995, and the same is anticipated for 1996.

In Southern Europe, growth in the Greek IT market was double digit. The Portuguese market was slightly below the European average with similar dynamics expected in 1996. In particular, EU-funded programs are boosting the professional-service market in the country.

Western European IT Hardware: Growth Returns

IT hardware revenues in Western Europe increased by 8.8% in 1995, up from 5.4% in 1994. Slightly lower growth, 7.6%, is anticipated for 1996.

The large-scale system sector experienced another year of decline in 1995. Though 1996 does not look much brighter, declines will likely moderate after that.

The flat performance in medium-scale systems in 1995 was driven by the increasing size of database engine sales. Small-scale systems also experienced flat performance. Despite demand created from falling prices, and the continued proliferation of client/server environments, total shipment values remained flat.

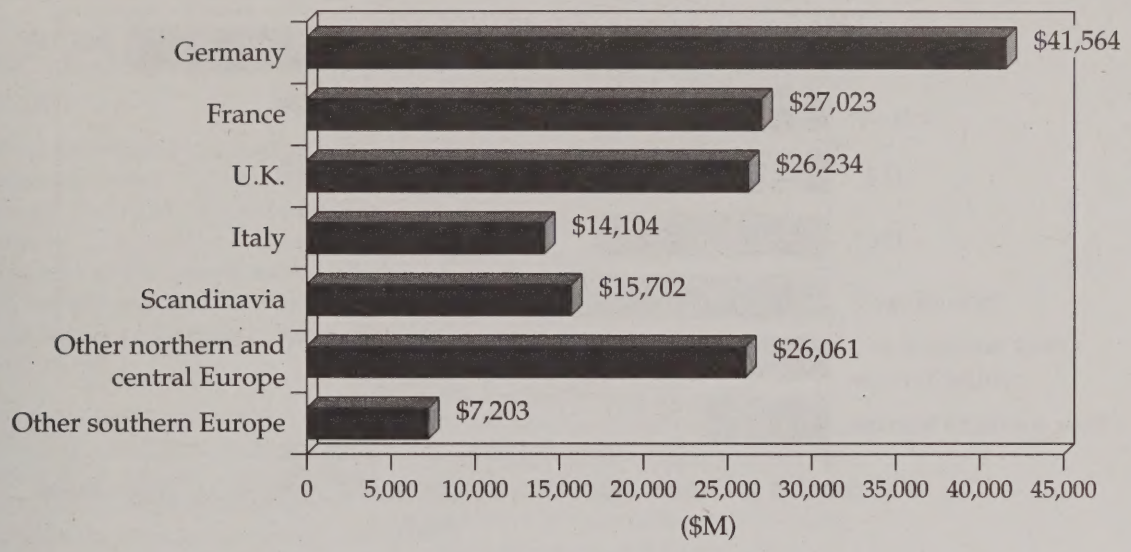
European PC buyers gobbled up higher-configuration systems. PC shipments grew by 16% in 1995 from 1994 in Western Europe, while the value of shipments grew slightly faster.

The market for desktops bound for the home market continued to expand at high rates. Sales of PCs purchased out of consumer disposable income drove overall PC growth in Europe (as in the United States). However, the household segment developed much more slowly in some countries than others, with no take-off expected in Spain, Italy, or even France until 1997. Germany continued to experience an explosion in demand from the small-business community and, particularly, for PCs to be used at home.

Western European Nominal IT Growth by Country, 1994–1995 and 1995–1996

Source: International Data Corporation, 1996

Western European IT Market by Major Country, 1995 ($M)



Source: International Data Corporation, 1996

The workstation market continued to expand by double digits in 1995. The high growth rates were driven by considerable activity among vendors with new products. This was further supported by the traditional workstation market, which has still to reach saturation point.

In the printer market, growth in color-capable inkjets was superseded by the growing market for color nonimpact printers. Even as a switch has occurred from impact to nonimpact printing, the printer market will transition from monochrome to color output over the next few years.

The inkjet market boom coincided with strong PC growth and found a potent new market among small-office and home-office (SOHO) users. Meanwhile, the laser page-printer market continued to grow.

The bulk of growth in the LAN hardware market came from sales of internetworking equipment and smart hubs offering both local- and wide-area networking facilities. By contrast, the network interface card market remained essentially static.

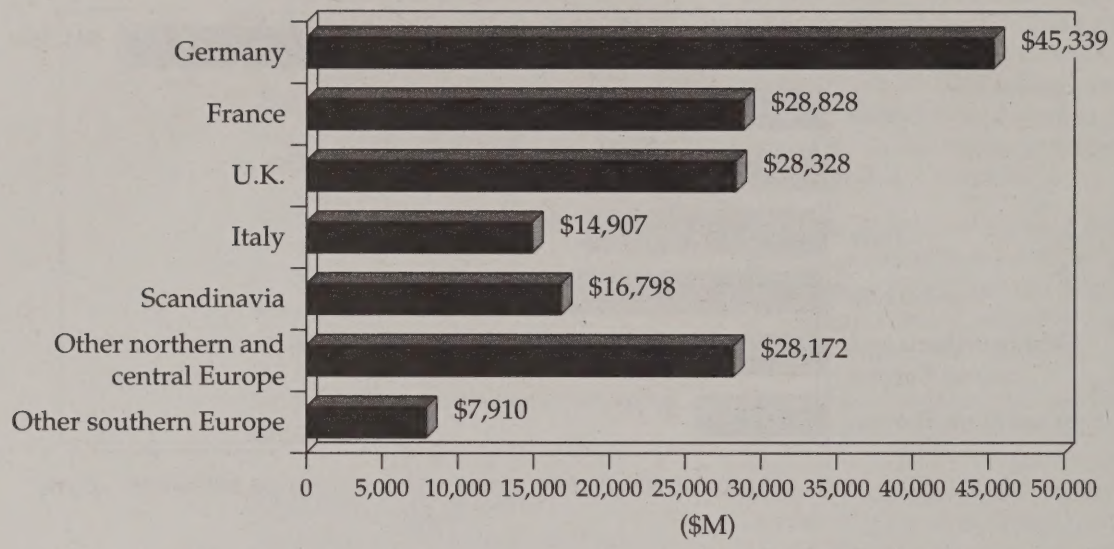
Software Products: Driving Growth

Software products proved yet again to be one of the stronger IT markets in 1995. Software sales rose 8.9% in 1995 and are expected to increase by 9.4% in 1996.

Growth in the European packaged software market continued to be driven by application tools and application solutions. In contrast, the systems and utilities market showed less growth. The cost advantage of packaged software over custom solutions (a component of professional services) ensured higher growth in sales of packaged software than in sales of custom-based software options. Distributed systems and Windows 95 are the factors most likely to boost the packaged software market in the near future.

Generally, buyers wish to minimize the cost of all software when building unique competitive advantage from "strategic software." They require application-development tools and enterprise-management software built for, and operating in, a distributed

Western European IT Market by Major Country, 1996 ($M)



Source: International Data Corporation, 1996

environment. Distributed applications are, by and large, client/server applications.

Windows 95 will boost the packaged software market over the next few years, with the SOHO market expected to be first off the mark among the target populations. Although this group will be early adopters through OEM channels, there will be low upgrade rates at the beginning of the product's life cycle. Power users are expected to have the highest upgrade rates, whereas large corporate users are expected to wait for some time before buying in bulk.

Operating systems account for more than 40% of this market and will remain the dominant segment until the end of the decade. The second largest segment is middleware and utilities, with performance-management software accounting for a further 30% of the market. Operating systems and middleware are both showing healthy growth at present. These markets have been fueled by the movement to Unix systems and the middleware need to support them.

In the area of tools, databases are the largest subsegment, followed by third-generation and fourth-generation languages. Application-development tools are forecast to keep a double-digit average annual growth (in the region of 13%) over the 1995 to 2000 period. The fast adoption of new products with expected productivity or quality improvements will ensure high growth rates in the tool sector.

Some of the strongest growth-rate projections are for object-oriented technology. The market for object-oriented software was particularly strong in 1994, with 25%+ growth forecasts for database management systems (OODBMS), object-oriented CASE, and object-oriented programming. However, these markets still constitute a relatively small part of the whole tool market. Database management systems (DBMS) are growing at a rate of 15% to 20% and account for almost a third of the tool market.

In the applications market, accounting and word processing are the most important sectors, followed closely by edutainment and infotainment

consumer software. Growth in the 15% to 25% range was experienced by these markets in 1995.

Services: a European Strength

The professional services market outperformed the overall IT market by growing 8.3% in 1995 and is forecast to increase by 6.7% in 1996. However, wide differences in growth rates both within the segment and between countries make this a collection of many different markets.

Growth in spending on custom software in 1995 was flat as companies increasingly demanded packaged solutions requiring slight customization rather than the creation of customized systems. IT consulting, systems and network implementation, and education and training experienced strong growth although these segments are not expected to maintain the same sustained growth over the next few years. The market for professional services was, and is still, subject to continued downward pressure on prices.

The IT consulting market will increasingly benefit from IT- and management-related issues. User corporations will focus more on improving business processes, not only on how to roll out the information technology in the department or enterprise. Business-process reengineering services are already beginning to meet this need and will represent a growing share of the market.

The U.K. professional services sector benefited from general economic growth and high productivity (following much corporate downsizing during the recession). A fast take-up of outsourcing was driven by the present government's policy of "market testing" public services.

Growth in Europe's largest professional services market, Germany, was mediocre. IT consulting performed well, driven by growth in the eastern German economy. The French professional services market has always been disproportionately large for the size of the country's IT market. Growth last year was poor as custom software suffered from a lack of demand for external programming because companies preferred to employ internal IT professionals.

The Italian market was affected by reduced expenditure in several key vertical sectors. The manufacturing sector and central and local government all held back in their expenditure plans.

High growth rates in Sweden were solely the result of a small number of very large facility-management contracts, and the Dutch market suffered as a result of competition from packaged solutions and a fierce price war among local service vendors.

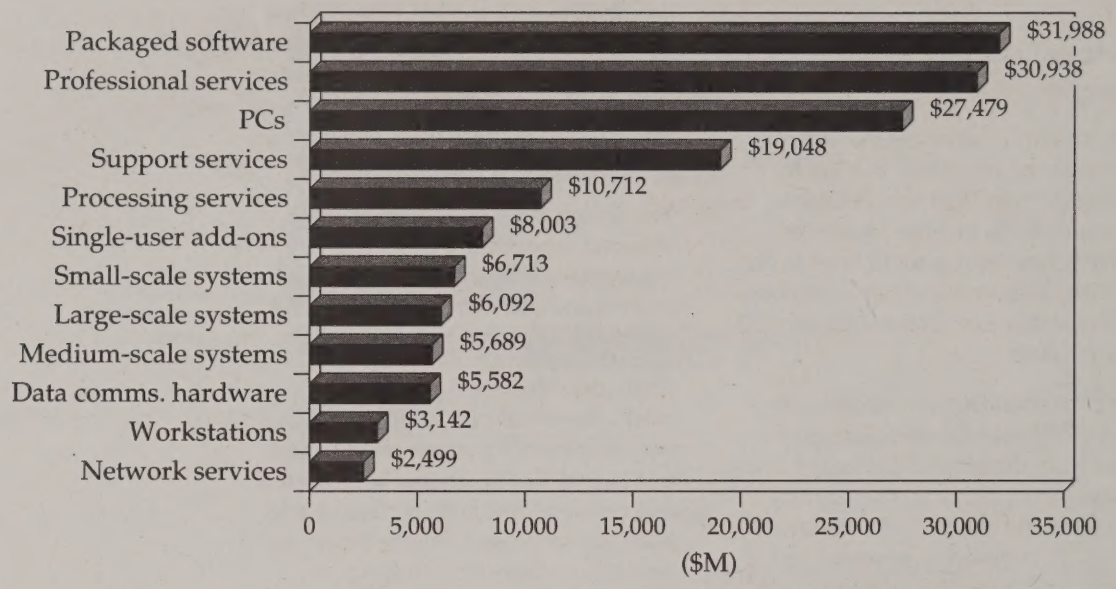
Network Services: 1996 Boom?

Network services, which include managed network services such as EDI and electronic mail services, grew 15.7% in 1995 and are forecast to expand 17.8% in 1996. Network services are expected to remain among the fastest-growing segments of the entire IT market.

The growing requirements of managing enterprise networks are leading to increased demand in this segment. The increasing complexity of network technology has caused more large and medium-sized businesses to consider using an external service provider to supplement their skill sets. Key factors in determining the level of usage of outside vendors for network services are the competitive environment, the level of internal networking expertise, and the importance of the network to customer satisfaction.

As more business-critical applications are transferred to the network, optimizing network performance is becoming crucial. To maintain a required level of performance, resource-constrained network managers are seeking to comple-

Western European IT Spending by Market Segment, 1995 ($M)



Source: International Data Corporation, 1996

ment their capabilities and increase their effectiveness while maintaining control of key areas like strategic planning. Moreover, business units continue to make decisions independently and implement systems and practices that affect the overall network. As a consequence, network managers must spend increasing amounts of time coordinating various demands that are put on the network.

Support Services: Reflecting the Diverse Trends in the IT Hardware Market

The support services market declined by 0.2% in 1995. In 1996 it is expected to increase by 1.5% as a result of different trends in the software and hardware support markets. Although the former is showing strong growth rates, the latter appears to be stabilizing after several years of decline.

On-site hardware maintenance still accounts for a large portion of the whole. But the needs of customers are changing: businesses are rapidly adopting the distributed computing model and shifting away from big-iron multiuser systems. The new model is based heavily on client/server applications and complex PC-based networks. With this shift comes the businesses' needs for multivendor expertise as well as system management and operational types of services. Systems have generally become more reliable, and new technologies such as RAID are designed to let customers perform a certain degree of self-maintenance.

Where growth exists in hardware support, it is less likely to fall into the traditional break/fix maintenance services. Instead, these services provide some form of system and peripheral management (asset management, predictive maintenance, and system maintenance), or let the end user or customer access support information more efficiently (online knowledge-base and bulletin-board services).

Software support has been driven by the strong and growing market for

telephone support services. However, on-site software support and system management are both substantial sectors of this market.

The Shift in Short-Term and Long-Term Spending Patterns

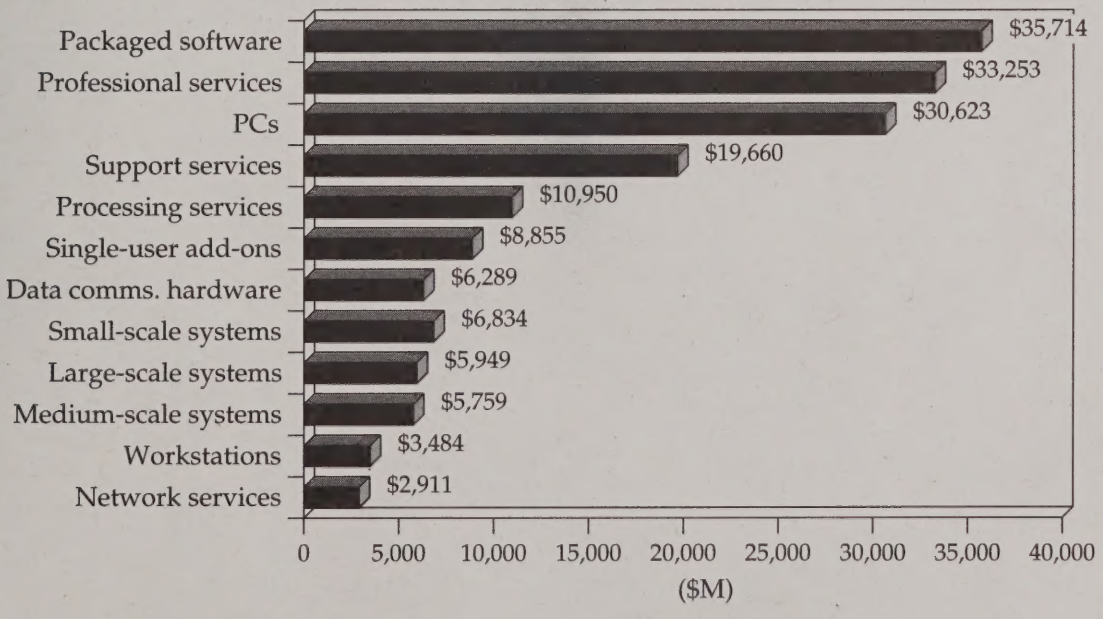
Europe provides first-hand experience that economic expansion does not by itself mean IT market expansion. When economic growth in Europe is driven by exports, incremental short-term IT investment is likely to prevail. Whereas when economic growth is driven by expansion in domestic demand, innovative long-term IT investment is the prevailing pattern.

Currently, the European economy is fueled by expanding exports, generated by favorable European currency rates. As national economies strengthen and business confidence improves, the near-term future will see a shift from the former to the latter.

Renewed vigor on the investment front is further encouraged by a general willingness to participate and engage in new business models. Companies are adopting innovative techniques that involve a move away from the traditional data-accessibility focus toward the favoring of organizational interaction. This is a more major shift for many large European IT buyers than for U.S. buyers and has therefore taken longer to evolve and will likely continue to do so.

Long-term, radically innovative IT investment is encouraged by increasing competition in traditional vertical markets. More and more companies are seeking to differentiate themselves by investigating opportunities in alternative industries and EU markets. This action consequently is fostering a number of alliances, primarily in the retail and finance sectors. Additionally, demand will flourish for new technologies that will enable these fledgling business models to work effectively

Western European IT Spending by Market Segment, 1996 ($M)



Source: International Data Corporation, 1996

across borders and industries. Naturally, the opening of European borders allows expanding European businesses to take advantage of the resulting economies of scale.

Many of these favorable market conditions for IT investment growth are in place, certainly in Germany, the United Kingdom, and to a lesser degree Scandinavia. A second tier dominated by France, Italy, and Benelux, and a third tier of the remaining southern countries clearly are moving in this direction. As the pace of change and growth varies country to country, so will the core demand for IT solutions.

Ultimately, a single point of economic growth will mean two to three points of IT market growth. Moreover, a self-perpetuating cycle of growth will likely emerge. IT growth will translate into overall economic growth with the addition of more IT-related jobs.

The future of European IT spending looks brighter than it has in several years. Add the potentially large and yet chronically undercomputerized nearby markets of Russia, Eastern Europe, Turkey, and parts of Africa, and a broader European market could well see sustained growth for many years.

THE GRAY SHEET
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Global market intelligence on the information technology industry since 1964.

IT Services: The Rise of the Business Integrator

The pace of change within industry is extraordinary. Over the past decade, areas such as distribution, inventory management, customer service, and product development have undergone a remarkable transformation. The pace of change has let up little. Corporations that need to prioritize investments continue to evaluate these processes and to look at other areas including customer management, the sales force's efficiency, document management, and the management of disparate information throughout the organization for improved decision making. As the pace of corporate change accelerates, the ability of companies to call on the diverse and focused expertise of consulting firms becomes more critical.

The emerging service-firm business model blends business and technology-related consulting with integration and outsourcing. This comprehensive consultancy is commonly referred to as a *business integrator.*

Establishing corporate direction can be influenced by a number of consultative activities: evaluating opportunities to create competitive advantage, assessing the direction of other competitors in the industry, and prioritizing the steps to achieving goals. Once the direction has been set, corporations must assess the current activities and skill sets of employees and determine how to proceed toward incorporating change. Considerations include organizational structure, education, the application of technology, and transition.

Despite all of these steps, consulting expertise is currently segmented into the following areas:

- Strategic and business consulting
- IT architecture planning and design
- Consulting on specific technologies

Although this segmentation makes sense based on reputation, traditional buyers of services, and culture, it has not solved the growing enigma for corporations: ensuring that the right technology is applied to solve current and future business problems in the best way. And therein lies the problem. How can a market in which focused expertise should thrive to meet the

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rapid change adjust to deliver the compendium of skill sets necessary to solve the overall problem?

How many consulting firms can solve this problem completely? How many companies are able to provide the various levels of consulting expertise and the follow-on integration to solve the problem in an efficient and cost-effective fashion?

Strategic consulting organizations like the Boston Consulting Group, McKinsey & Co., Bain & Co., and Booz-Allen & Co. are placing more focus on IT strategy consulting for clients, particularly as it relates to the overall business strategy. For example, what areas of the organization or which technology areas should be outsourced? Or should they be outsourced at all? But the questions do not end there. A growing area of interest is the outsourcing of business processes or functions. How it fits into a company's overall strategy will concern consultancies. In addition, these consulting firms are evaluating the IT architecture, the applications, and how IT is supporting the company's mission. The more critical these issues become, the more emphasis strategy firms will place on enhancing this expertise.

The large service firms are positioning themselves to deliver a comprehensive service of business and technology-related consulting to design and implement a comprehensive solution for the client. Firms include players from the management consulting, Big Six, systems integrators, and systems vendor ranks. The list includes familiar names such as Andersen Consulting, Cap Gemini Sogeti, CSC, EDS/AT Kearney, and IBM.

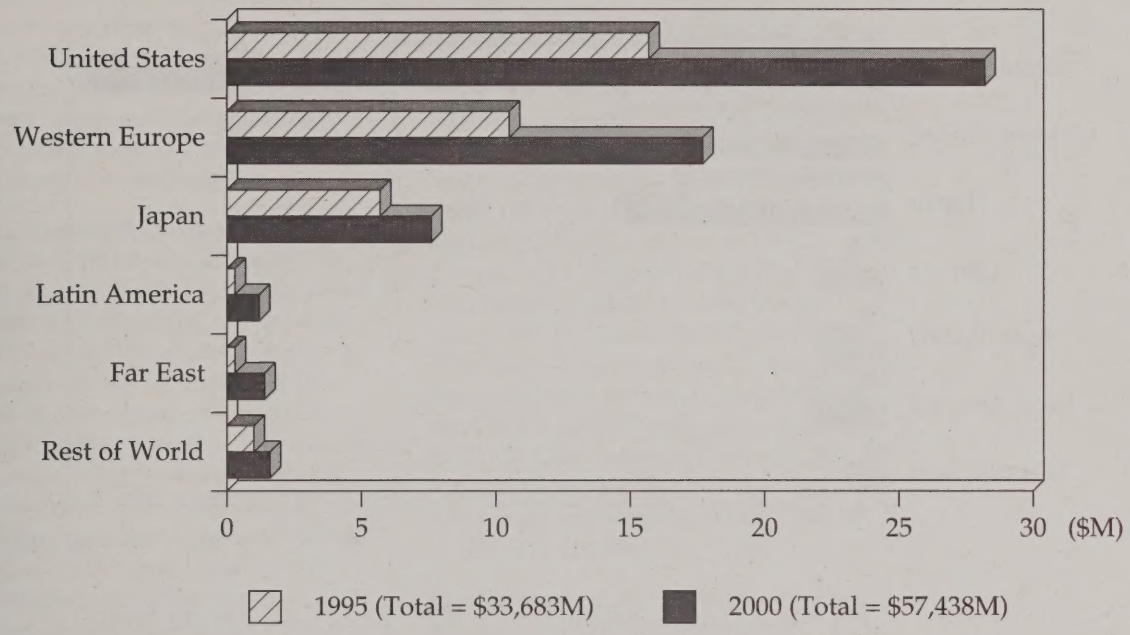
With the exception of EDS, CSC, and Gemini Consulting, these firms have built practices in the business and IT consulting areas from the ground up. However, every firm on this list is struggling to build and implement a comprehensive strategy that links the business consultants, the change-management consultants, and the IT consultants.

These changes have sparked a battle in the industry that will continue to be fought for the next five to ten years. As consulting organizations and their integration arms continue to evolve toward a similar culture, patterns toward corporations using fewer consulting firms could evolve. For consulting firms to survive in this environment, patterns of synergy from teamwork and communication must occur across the various skill sets. This is the only way in which the linkage between technology and business problems can be solved. At this point, many consulting organizations understand the problem, but struggle to solve it.

IT Services Review and Forecast

In 1995, the three arms of IT services — systems integration, consulting, and outsourcing — enjoyed solid growth. The prospects for the three worldwide markets are positive throughout the rest of the decade. In this issue, *The Gray Sheet* explores the dynamics causing IT Services to expand throughout the world and the issues threatening to curtail that expansion. Particular attention is given to the U.S. market, which continues to set the trends in all three service areas.

Worldwide Systems Integration by Region, 1995 and 2000



Source: International Data Corporation, 1995

Systems Integration: Stability Reigns, Competition Lurks

The worldwide systems integration services market continued its moderate to strong growth in 1995, increasing by 8.4% to a total market size of $35,673 million. It is projected to grow at 10.9% through the year 2000. The United States continues to account for the largest share of the worldwide market, claiming a 44.0% share in 1995, projected to grow to 47.2% by the turn of the century.

Europe takes second place, accounting for 35.6% of worldwide market share; its share will decline slightly to 34.6% by the year 2000. Despite its projected decline in overall share, the European market, like the U.S. market, will continue a healthy double-digit growth.

Japan holds a distant third position, with a worldwide market share of 16.1% in 1995. Japan will experience the slowest growth rate of all the major markets, and its market share will fall accordingly, declining to 12.8% by the year 2000. Japan's systems integration market is not expected to grow much above the rate of inflation.

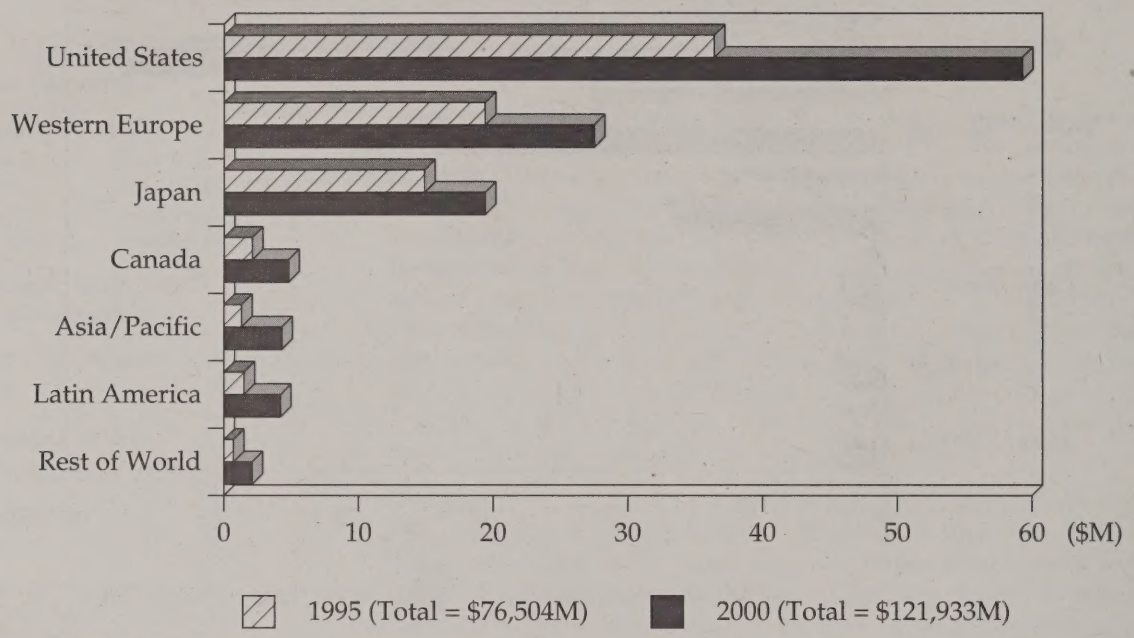
The fastest-growing systems integration markets will be in the emerging economies of the Far East and Latin America, both of which are expected to chalk up CAGRs of more than 20% through the year 2000. These regions, however, have very small market bases, each region accounting for less than 1% of the worldwide market share. Their superior growth rates, therefore, must be put into this perspective.

Key Trends

The changing dynamics of the market can create opportunities for flexible and forward-looking firms. Four trends are predicted to have major impacts on the business models of systems integrators:

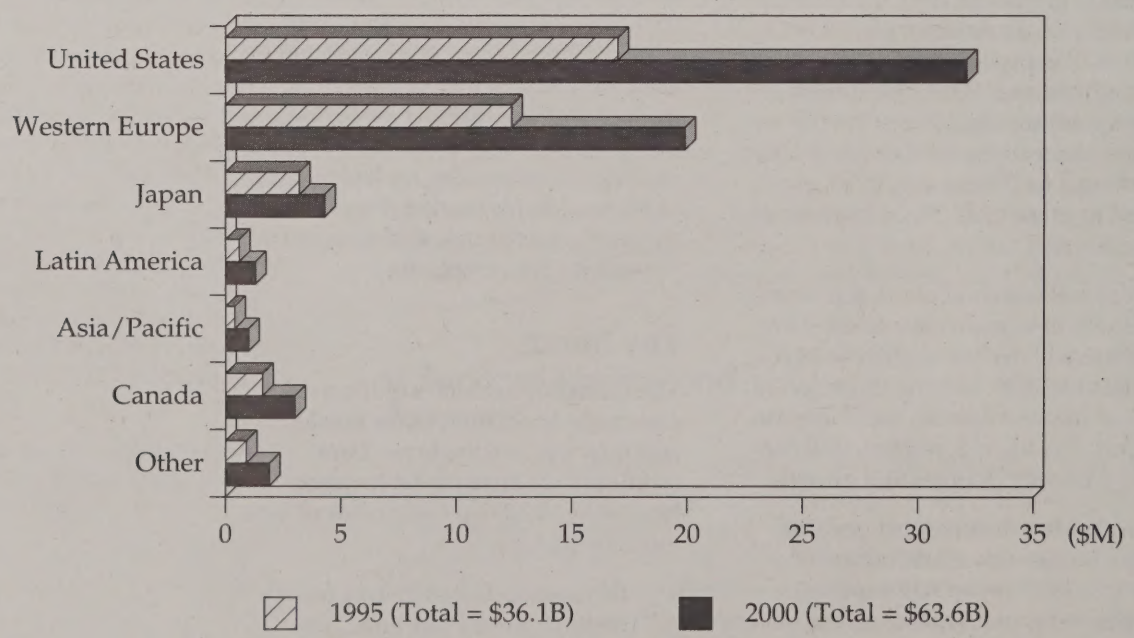
- **Increasing importance of rapid deployment of solution.** This trend not only influences the need for skill sets in technologies such

Worldwide Outsourcing Spending by Region, 1995 and 2000



Source: International Data Corporation, 1995

Worldwide Consulting Services Spending by Region, 1995 and 2000



Source: International Data Corporation, 1995

as rapid application development (RAD) and object technologies, but also the need for increased R&D in preengineered modules and applications. A rapid deployment methodology also involves changing the basic structure of the systems integrator's organization to include a structure that enhances sharing and encourages learning.

- **Increased acceptance of enterprise application software.** This trend changes the dynamics of the systems integration market. Custom software has lost stature. The competitive landscape will favor integrators that partner with the right software vendor and wrap the right mix of services around the applications. Unfortunately, the increased acceptance of enterprise application software will offer continued encouragement to that new group of service vendors eager and able to cash in on the systems integration market: the successful software vendors.

- **Project segmentation.** The movement toward breaking up one big project into several smaller phases puts more pressure on systems integrators to meet the specified time frame and deliver within budget. Failure to do so results in not being chosen for the next phase. It also forces them to spend more time and money marketing, and creates a less secure revenue stream.

- **The increasing popularity of outsourcing.** This trend potentially locks out integrators as the outsourced functions become captive markets of the outsourcing providers. Systems integrators without outsourcing capabilities need to partner with outsourcing providers to turn this threat into an opportunity.

Consulting Services: Business and IT Expertise Converge

The worldwide consulting market, consisting of management and IT consulting, continues to expand at a rapid rate throughout the world as corporations struggle to adapt to new technologies and their application to business solutions. The worldwide consulting market measures $36.1 billion in 1995, a growth of 15.1% over 1994, led by the IT consulting segment of the marketplace at $19.8 billion (16.8% growth). With the exception of Japan, all regions enjoyed strong growth in 1995. In 1996, worldwide growth is expected to slow to 11.5%. Over the next five years, the consulting market will increase at a compound annual growth rate (CAGR) of 12.0% to $63.6 billion.

Throughout the rest of the decade, the strongest growth will occur in Asia/Pacific and Latin America due to the relatively small base and the drive to be more competitive in the global marketplace. Despite its large base, the United States will continue to achieve strong growth. In 1995, the United States represented 47% ($17 billion) of the worldwide consulting market, followed by Western Europe with 34% ($12.4 billion). By the year 2000, IDC believes that the United States will actually hold a larger worldwide market share at 50%, with revenues of $32.1 billion.

Western Europe's market share will decrease slightly over the next five years (31.0%) although growth overall will continue to be quite strong ($19.9 billion, 9.9% CAGR). Japan's market share will also decrease, from 8.9% to 6.8%, as the trend toward adopting external consulting expertise continues to be slow.

Key Trends

While IT consulting activities continue to lead the way in terms of growth, overall consulting demand is driven by the tremendous rise in projects that link IT architecture to new or enhanced ways of doing business. Activities such as business process reengineering, process improvement, change management, and operational consulting continue to grow rapidly, and large traditional markets such as IT planning and design activities continue to have strong demand. Addressing these issues, along with an intelligent implementation of a business marketing plan, will position these consulting firms for the future.

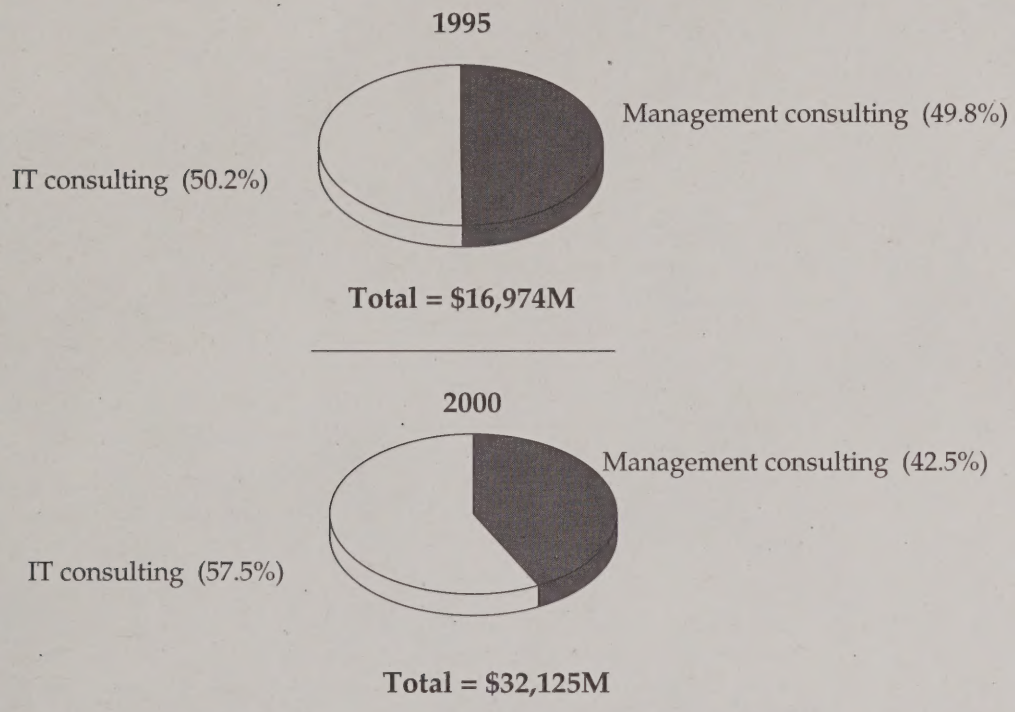
Major challenges for consulting firms will be using research and development intelligently, building necessary scale to remain competitive, and investigating new uses of leverage to raise productivity and profitability. Following are trends in the industry:

- **Business process reengineering remains a key competitive area.** Although there are consulting firms with certain areas of focus, the practice of reengineering continues to be a common one within traditional management consulting and IT consulting firms. It is the practice in which the integration of consulting skills can be best applied. And although reengineering has cooled as a buzzword, it remains a key focus within corporations. Once synergies between business and IT skills can be further demonstrated in this area, the market dynamics for success in the consulting industry will change.
- **Leveraging knowledge to build new businesses.** All consulting firms are in the business of consulting to demonstrate superior creativity and expertise on a given subject to help clients achieve and maintain competitive advantage. However, some consulting practices are also looking to the future to understand how their expertise and knowledge can be applied in industries in which duplication of effort is not warranted and where economies of scale can be achieved to build new businesses into some area of process outsourcing. These organizations are attracted by the challenge of directly achieving ongoing advantages for clients through direct ownership of the results as well as the influence consultants can have in recommending the outsourcing of these critical areas.
- **Margins of consulting organizations continue to be strong, but investment needs are growing.** Despite the competition for talent in many areas of the consulting industry, the margins in this business continue to be strong. In the IT consulting area, profit margins vary from 7% to 20% before taxes. The management consulting firms have even stronger results, although they are more difficult to finalize due to the heavy influence of bonuses for principals and senior partners. However, leverage is being introduced to the business model. In particular, investments in electronic methodologies, best-practice databases, market research studies, and enabling tools and technologies for the benefits of quality, speed, and consistency are rising. This is part of the advantage seen in developing economies of scale in the industry moving ahead.

U.S. Consulting Services Market

The U.S. consulting marketplace continues to drive ahead and remains the primary test bed for new business application concepts and research to support the other regions of the world. In 1995, the overall consulting marketplace grew to almost $17 billion. By the year 2000, the market is expected to exceed $32 billion. The IT consulting marketplace will continue to grow in dominance.

U.S. Consulting Services Spending by Segment, 1995 and 2000 ($M)



Source: International Data Corporation, 1995

This forecast is due to the following circumstances:

- In the United States, competition to integrate IT and business consulting is an imperative more than anywhere else in the world.
- The focus by traditional IT consultants to build business expertise will continue to occur, raising competition and recruiting more management talent out of industry. Smaller integrators and software companies will place more emphasis on building expertise in this area in the future.
- Investments by consulting firms to understand organizational change and direction will be of increasing attraction to U.S. management.

Outsourcing: The World Is Catching On

The global outsourcing market experienced perhaps its most successful year in 1995, with major deals signed in nearly every corner of the globe. Most notably, the European market exploded; four of the five largest outsourcing deals were signed in that region (three in the United Kingdom and one in Switzerland). The global outsourcing market totaled $75.8 billion in 1995 and is expected to increase at a CAGR of nearly 10% through the end of the century.

American companies remain the largest users of outsourcing services, nearly doubling the total revenues generated in Western Europe, the second largest market. In 1995, the United States accounted for nearly 48% of worldwide

outsourcing revenues with $36.4 billion dollars. Western Europe claimed only 25.6%, or $19.4 billion. Japan was the third largest segment, accounting for 19.7% of the market, or $14.9 billion. Canada, with $2.1 million (2.8%), Latin America, with $1.5 billion (1.9%), and Asia/Pacific, with $1.3 million (1.2%) round out the outsourcing field.

However, from 1995 through 2000, the U.S., European, and Japanese markets are not expected to grow as quickly as those in Canada, Asia/Pacific, or Latin America, partly because of market saturation. The CAGRs for the United States, Western Europe, and Japan are projected to be 10.2%, 7.2%, and 5.5%, respectively. In contrast, Canada, Asia/Pacific, and Latin America will grow at 17.9%, 26.4%, and 23.0%, respectively.

This trend was evident in 1995, as the outsourcing market continued to grow rapidly and experienced unparalleled success in non-U.S. regions. In both revenue growth and market significance, outsourcing is increasing quickly and becoming a viable option for large and medium businesses alike around the globe. Major deals were inked in nearly every region of the world, and outsourcing vendors experienced tremendous international growth. Market saturation in new outsourcing markets is not expected to be a consideration for many years.

Key Trends

Two fundamental reasons exist for continued strong growth in the global outsourcing market through the end of the decade:

- Managing information technology, especially distributed architectures, is becoming increasingly complex and expensive.
- Information technology is becoming more critical to successful business performance. That is, IT is no longer a peripheral component of most organizations. Rather, it is implicit in many key business processes.

This impressive growth is fueled by two fundamental types of outsourcing services:

- Processing (claims, transaction, and billing) accounted for 62% of the market. Information technology (data center, client/server, network and applications) accounted for 35% of the total market in 1995. Business process (customer service and accounting) accounted for 3% of the market.
- Business process outsourcing services are expected to experience the fastest growth and subsequently increase as a percentage of the total market to approximately 7% by 2000. However, the entire market is expected to grow at healthy rates through the year 2000.

THE GRAY SHEET
Computer Industry
REPORT

Global market intelligence on the information technology industry since 1964.

The Global PC Market: Facing the Eastern Challenge

The 21st Century is nearly upon us, and pundits far and wide have anointed the next hundred years the Asian Century. Economically and politically world power is projected to shift eastward. China, Japan, India, and the Little Dragons — the ranks of which seem to increase yearly — are expected to challenge the centuries-old hegemony of Europe and America. The worldwide PC industry may preview the coming rivalry. As the 20th century winds down, the blossoming Asian PC industry provides an early and substantial threat to the old guard.

In both manufacturing and consumption, Asia/Pacific represents the most dynamic region of the worldwide PC industry. The U.S. market remains robust, but growth will slow as saturation approaches. In contrast, the short-term, high-growth regions are Asia/Pacific, Japan, and Latin America. On the manufacturing side, U.S. PC companies depend on Asian suppliers. The Asian foundry has enabled U.S. players to gain and maintain substantial market share — to dominate the world market. Tested and confident Asian manufacturers are now gearing up for expansion across the Asia/Pacific and into the United States. Soon U.S. PC suppliers will be competing with aggressive Asian companies in both regions.

Asian players, primarily Japanese and Korean corporations, are not strangers or novices in the U.S. market. Toshiba has been a perennial leader in the laptop market. NEC has enjoyed mixed results. Many others tried to compete in the United States in the late 1980s, predominantly as IBM clone suppliers. That initial foray was short lived and largely unsuccessful, but a second, better-planned, assault is imminent. The new-wave Asian suppliers are not just me-too players scrambling for low-end market share. Instead, manufacturers are looking for strong, early position in the race to provide the next-generation personal computing devices that project as such a huge opportunity in the consumer market.

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The firms best positioned to compete count as assets vertically integrated manufacturing and a legacy of success in consumer, as well as computer, electronics. Sony is the prototype, with capabilities in audio, video, semiconductor, and storage. It is this group that intends to become a factor in the U.S. PC market. Perhaps learning from Toshiba's success, Hitachi and Fujitsu both will enter the U.S. notebook market by the second half of 1996. Like Toshiba, Fujitsu has a long supply of component manufactures and will attempt to leverage its large economies of scale through internal procurement and internal sourcing against the company's horizontally structured competitors.

Current market leaders will not be caught unawares, however. Globalization brings with it the realities of global competition. The now-dominant U.S. firms can lean on their ability, well tested in recent years, to adapt to globalization, new technology trends, intense channel competition, and disappearing margins. Intensified competition, from Asia and within their own ranks, will force PC heavyweights to further diversify products, business processes, alliances, organizations, and infrastructures in the quest to gain and protect market share.

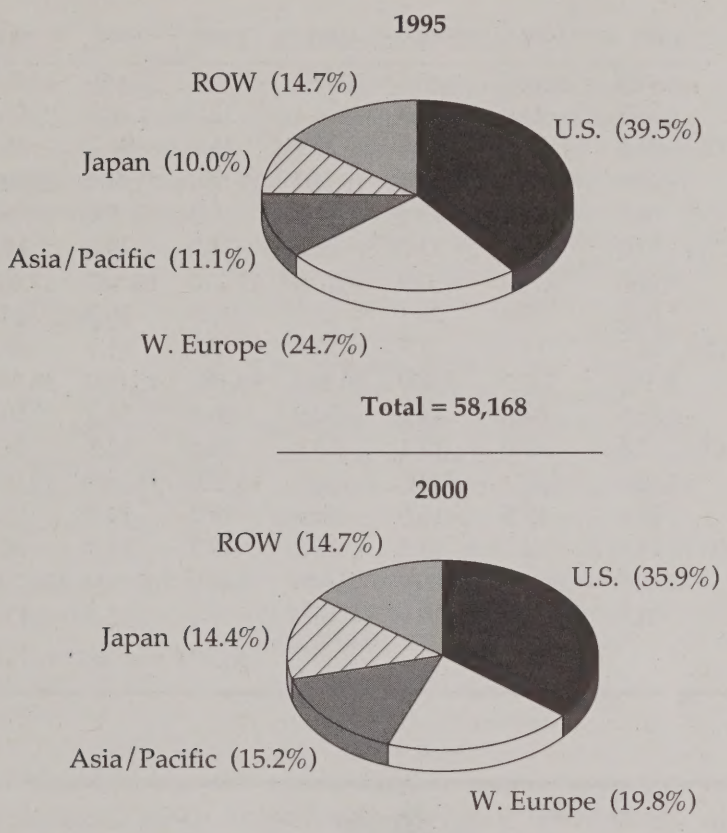
Major vendors, such as Compaq, Hewlett-Packard, and IBM, have set into place strategies designed to consolidate market share on a number of fronts.

- Global product lines have become a lot more prominent, and subsequently branding has become a priority. Consequently, advertising has taken on a more global character to boost broad-based, consistent brand awareness. To supplement the branding effort, investment in regional infrastructure will become critical for companies to gain regional market share more effectively.
- To combat margin pressures, companies have placed renewed focus on business processes and improving efficiencies, down to very small aspects of the total equation. For example, Compaq deployed a team of people in Taiwan to reduce costs associated with parts procurement.
- Firm commitment to the consumer market is now the norm. All of the major players have either expanded or formed consumer divisions to exploit this growing part of the marketplace.

Globalization itself, though a clear trend, is not an easy road to travel. A company like Fujitsu faces a tough challenge entering the U.S. notebook market, especially with its lack of brand awareness in the U.S. marketplace. Although Fujitsu will concentrate initially on higher-margin notebooks, volume is starting to shift slowly to lower-margin products in the retail channel. Eventually, Fujitsu must build its brand recognition in the retail segment to generate the volume that maximizes its internal economies of scale and time to market.

Global competition also moves product in both directions. If the U.S. market is at the saturation point, Asia/Pacific becomes the new prize. And U.S. suppliers have targeted Japan and the Pacific region for some time. All of the major players are visible in Japan. Operations are constantly springing up across the region. Dell, which in the past has been criticized for its U.S.-centric business model, has opened offices in several Asian nations over the past 12 months.

Worldwide PC Unit Shipments by Region, 1994-2000



Source: International Data Corporation, 1996

The present and future rivalry between Asian and American suppliers also opens the door to cooperation. Given global market realities, alliances and partnerships will be forged. Samsung has virtually merged with AST. Portending the trend more completely is the Packard Bell, Zenith, and NEC alliance. The three companies will combine efforts on manufacturing and procurement as well as share technologies. Such partnerships will enable suppliers to keep up with the demands of the ever-accelerating market and to leverage distribution in multiple geographies.

PC Marketplace Overview

The global PC market enjoyed another boom year in 1995. Worldwide PC shipments increased by 23.7% in 1995, from 47.0 million to 58.2 million, besting 1994's 20.5% growth rate. Leading the way was a Japanese market growing like wildfire with shipments up an incredible 66.3%. Asia/Pacific (up 27.4%) and the United States (up 23.0%) markets turned in solid years. Through the end of the decade, worldwide PC shipments are projected to tail off to a CAGR of 13.7% and a total of 115.8 million. High double-digit growth will continue in Japan, Asia/Pacific, and the ROW while U.S. and Western European shipments slow to 11.9% and 8.9%, respectively.

Worldwide PC Unit Shipments by Region, 1994–2000 (000)

	1994	1995	1996	1997	1998	1999	2000	1996–2000 CAGR (%)
U.S.	18,700	23,001	26,511	30,262	33,960	37,659	41,501	11.9
Growth (%)	24.3	23.0	15.3	14.1	12.2	10.9	10.2	
Worldwide share (%)	39.8	39.5	38.3	37.4	36.7	36.2	35.9	
W. Europe	12,500	14,376	16,300	18,202	19,890	21,404	22,883	8.9
Growth (%)	14.7	15.0	13.4	11.7	9.3	7.6	6.9	
Worldwide share (%)	26.6	24.7	23.5	22.5	21.5	20.6	19.8	
Asia/Pacific	5,060	6,446	8,129	10,020	12,210	14,682	17,612	21.3
Growth (%)	NA	27.4	26.1	23.3	21.9	20.3	20.0	
Worldwide share (%)	10.7	11.1	11.7	12.4	13.2	14.1	15.2	
Japan	3,500	5,822	8,390	10,980	13,180	15,090	16,700	18.8
Growth (%)	35.5	66.3	44.1	30.9	20.0	14.5	10.7	
Worldwide share (%)	7.4	10.0	12.1	13.6	14.3	14.5	14.4	
ROW	7,255	8,523	9,890	11,476	13,220	15,064	17,049	14.6
Growth (%)	NA	17.5	16.0	16.0	15.2	14.0	13.2	
Worldwide share (%)	15.4	14.7	14.3	14.2	14.3	14.5	14.7	
Worldwide	47,015	58,168	69,219	80,940	92,460	103,900	115,745	13.7
Growth (%)	20.5	23.7	19.0	16.9	14.2	12.4	11.4	

Source: International Data Corporation, 1Q96

Worldwide Value of PC Shipments by Region, 1994–2000 (U.S. $M)

	1994	1995	1996	1997	1998	1999	2000	1996–2000 CAGR (%)
U.S.	40,750	51,265	57,339	63,793	69,631	73,909	77,784	7.9
Growth (%)	29.4	25.8	11.8	11.3	9.2	6.1	5.2	
Worldwide share (%)	41.6	41.0	39.9	39.0	38.3	37.2	36.1	
W. Europe	23,927	28,303	31,344	34,519	37,107	39,949	42,813	8.1
Growth (%)	14.9	18.3	10.7	10.1	7.5	7.7	7.2	
Worldwide share (%)	24.4	22.6	21.8	21.1	20.4	20.1	19.9	
Asia/Pacific	9,839	13,656	16,694	20,012	23,983	28,241	33,038	18.6
Growth (%)	NA	38.8	22.2	19.9	19.8	17.8	17.0	
Worldwide share (%)	10.0	10.9	11.6	12.2	13.2	14.2	15.3	
Japan	10,789	16,044	21,171	25,480	28,823	31,429	33,861	12.5
Growth (%)	15.3	48.7	32.0	20.4	13.1	9.0	7.7	
Worldwide share (%)	11.0	12.8	14.7	15.6	15.8	15.8	15.7	
ROW	12,682	15,818	17,290	19,728	22,368	25,113	27,987	12.8
Growth (%)	NA	24.7	9.3	14.1	13.4	12.3	11.4	
Worldwide share (%)	12.9	12.6	12.0	12.1	12.3	12.6	13.0	
Worldwide	97,986	125,087	143,839	163,532	181,912	198,641	215,483	10.6
Growth (%)	27.5	27.7	15.0	13.7	11.2	9.2	8.5	

Source: International Data Corporation, 1Q96

The dollar value of 1995 shipments reached nearly $125 billion, up a healthy 27.7% from 1994. Japan again led the way with 48.7% growth, followed closely by Asia/Pacific at 38.8% and the United States at 25.8%. By the year 2000, the dollar value of shipments will grow a more modest 10.6% to $215 million. Asia/Pacific projects as the strongest market through the end of the decade with dollar value growth at 18.6% CAGR.

United States: 1995 in Review

The United States turned in a better performance in 1995 than 1994. Volume hit 23 million units, a major 23.0% increase over 1994 shipments of 18.7 million. The dollar volume of shipments grew 25.8% to $51.3 billion, illustrating the state of fixed price points, little room for margin adjustment, and the increased demand from home buyers for leading-edge feature sets and slightly higher-priced portables, which increasingly incorporate multimedia technologies.

Early-year concerns about moderating growth diminished as the economy stayed on track, the Internet exploded, rapid improvements in price/performance continued, product availability improved, and competition intensified.

IDC also believes 1995 was characterized by stronger-than-expected growth for both consumer and commercial desktop PCs. Consumer desktops were led by multimedia, the big shift to Pentium, the Internet, and family buyers. After receiving limited attention in 1994, major vendors — including Compaq, Hewlett-Packard, IBM, and Dell — focused on the commercial desktop, resulting in solid gains for the category. As the year progressed, corporate users jumped on the multimedia bandwagon.

The portable computer market proved disappointing in 1995 with unit volume up a paltry 11.5%. Much slower than anticipated growth hinged on delays and misforecasting of demand for key products, a buyer pause to assess the developing Pentium market, and the market's transition to value-focused models.

Outlook for 1996

For 1996, the rate of growth in the U.S. market will slow to a still-substantial 15.3%. A major factor will be a downshifting in the speed of price/performance improvements. The Pentium Pro processor will not be a major factor in the market in 1996, and Intel is unlikely to be able to advance Pentium technology fast enough to once again double performance at every price point as it did in 1994 and 1995. Consumer demand will still be strong, but it will grow less rapidly than 1995's hot pace as the home evolves toward more of a replacement market. Commercial purchases will slow as the overall growth of business investment tapers off. Government buying will be limited by federal downsizing and budget cuts.

The portable market, which experienced a much-slower-than-expected year in 1995, is expected to bounce back as heightened competition and price compression drive a furious pace of price action, product rollouts, channel positioning, and focus on offering value products. Unit volume in the portable market is projected to increase 23.1% in 1996.

Beyond 1996

After 1996, a period of moderating growth rates will characterize the U.S. PC industry. The 1996–2000 CAGR for units is forecast at 11.9%. On a year-to-year basis, growth is expected to decline at a steady pace from 15.3% between 1995 and 1996 to 10.2% between 1999 and 2000.

In many ways the longer-term growth outlook reflects the U.S. status as the world's most stratified and mature PC marketplace. The market has boomed since 1992, and in large part growth has been fueled by the home segment. Following such a boom period, it's natural that the market will pause to utilize the products that have been

purchased. The size of the U.S. PC market will have nearly doubled from 11.8 million units in 1992 to 23.0 million in 1995. Even with moderating growth, a net addition of 18.5 million units (23.0 to 41.5 million) is forecast from 1995 to 2000.

Accelerators

The key issues that will accelerate growth in the U.S. market are as follows:

- New CPUs, including sixth-generation microprocessors, primarily Intel Pentium Pro chip (in addition, the anticipated arrival of seventh-generation PC CPUs in 1997 is expected to help create new applications and market demand for PCs)
- Improving ease of use
- Low-cost PCs
- Expanding uses for PCs, for example —
  - The Internet
  - Multimedia applications
  - Electronic commerce and banking
- Memory price decline
- Growth in the portables market

Inhibitors

The key issues that will inhibit growth in the U.S. market are as follows:

- Saturation in the business market
- Weak demographics of nonhome PC owners
- Competition from other electronics devices, including new personal computing devices
- Limited opportunity for channel expansion
- Technical and economic risks

Western Europe: 1995 in Review

Western Europe turned in a slightly better year in 1995 with unit volume up 15% from 12.5 million to almost 14.4 million units. Although this growth rate lagged behind the United States, Asia/Pacific, and Japan, the region showed more resilience than anticipated early in the year. The region's largest market, Germany, hit nearly 4 million units but grew only 13% over 1995. France, the third-largest market, grew 18% as the home market there began to emerge. The United Kingdom, the second-largest market, grew just more than 15% in 1995, reaching more than 2.8 million units as the home market starts to boom.

Outlook for 1996

Growth in Western Europe will moderate in 1996; unit shipments are expected to increase 13.4%, and dollar value is expected to increase by 10.7%. The price of systems is expected to fall just slightly in the 2–3% range, depending on the product category. The small, mature countries in the region (Finland, Norway, Sweden, the Netherlands, Switzerland, and Austria), which all grew in excess of 20% during 1995, are expected to show more modest growth in 1996. Of the big three country markets (France, Germany, and the United Kingdom), only France is expected to show better performance in 1996 than 1995.

The key ingredients fueling growth in 1996 are expected to include adoption of MS Office 95, gathering momentum for upgrades of business PCs, and the small-office market being stimulated by lower PC price points. France and Italy are starting to embrace home computing, and the notebook market is expected to gain some momentum.

The key inhibitors of market growth include economic insecurity, especially among the all-important German economy. Other inhibitors include the high

Short-Term Accelerators and Inhibitors in the Global PC Market

Accelerators	Inhibitors
Unprecedented price performance improvements across all PC types—portable, servers and desktops	Key household segments (well-educated, upper-income) becoming saturated (especially in U.S.)
Growth of the PC server market	Channel expansion is moderating
Competitive urgency means acceleration in product improvements and innovation, heightened advertising and marketing, and creative price positioning	Internet backlash
SOHO market	Mixed world economic situation
Burgeoning global interest in the Internet	Slowdown in the U.S. home market
Business interest in intranets	PC still not a "home appliance"
Consumer multimedia	
Windows 95 and Windows NT	
Portable PCs	
Shrinking system life cycles boost upgrade demand	
Convergence of content, technologies, and communications on the PC broaden its base of applications and users	
Aging base of 386 and 486 machines in business due for upgrades	

Source: International Data Corporation, 1Q96

cost of entertainment and education software and the value-added tax prevalent in European countries, which inflates the total cost of PCs to consumers. As in the United States, saturation of target households for home computers is also emerging as an inhibiting factor.

Beyond 1996

Overall, the growth pattern in Western Europe is expected to show a steady decline over the forecast period. During that time, annual unit shipment growth will drop from 13.4% in 1996 to 6.9% in 2000. From a global perspective, this will put Western Europe well behind the worldwide growth rate for 1996–2000 (13.7%), resulting in a fairly significant loss of share. As a percentage of total worldwide PC shipments, the region will hold 23.5% in 1996, but only 19.8% by 2000. That share will be picked up primarily by Japan and the Asia/Pacific region.

As a whole, the mature state of the European PC market, coupled with a mixed economic picture, results in the rather low-growth prospects of the region on the worldwide competitive landscape. The small-office/home-office (SOHO) market will continue to be a long-term major growth factor in Western Europe. This growth is impressive; however, it lacks the explosive nature of the growth pattern in other rapidly expanding country markets such as Japan.

European countries join the SOHO/consumer phenomenon at different points in time and with varying patterns of growth. In the aggregate, expansion for these segments is not

expected to moderate until the end of the forecast period. IDC anticipates that, in recognition of the maturation of the consumer and SOHO markets, PC vendors will begin to further refine their product and market approaches to each of these segments in 1996 to reflect the differences among the respective target audiences.

Asia/Pacific: 1995 in Review

The 1995 Asian PC market's 27.4% year-over-year unit growth rate bested the United States. Shipments reached 6.4 million units at a value of $13.7 billion, up 38.8% over the previous year. This impressive jump in dollar volume is attributed to growth in the PC server market and robust sales in some areas of high-performance desktop machines. India was the region's fastest-growing PC market. It saw PC shipments leap 72% last year to 374,000 units. The often-focused-on China market posted the region's slowest growth rate (24%) except for Australia and New Zealand, two of the region's most mature country markets. The Asia/Pacific market was led by very strong performance for PC servers, followed by portable computers. Desktops grew below the market average.

The primary accelerator for the Asia/Pacific PC boom has been the region's tremendous economic expansion. Most countries are experiencing GNP growth rates as much as five times that of other industrialized nations. This burst of commercial growth has resulted in a burgeoning of the region's middle class. The rise in aggregate disposable income has produced gains in PC unit sales, and should continue to do so, especially because average selling prices will continue their long-term decline.

Also, the market's unifying embrace of the Windows standard will generate increased large-scale demand for PCs. A fragmented OS environment benefits niche players and stifles volume demand for industry standard hardware. The third accelerator is the move of worldwide production to the Asia/Pacific region. Not only are Japanese and U.S. vendors relocating to the Asia/Pacific regions to realize lower manufacturing costs, but also to start local production and service the hot Asia/Pacific markets.

With local manufacturing, OEMs can realize lower logistical expenses, minimize supply constraints, and generate local market interest. For example, Compaq this year will complete the expansion of its Singapore factory — making the site the company's second-largest facility. Compaq's expanded Singapore operations will service its growing regional business as well as provide low-cost manufacturing for other regional markets.

Outlook for 1996

The region will continue its booming growth at 26.1% to 8.1 million units through 1996. The dollar value of shipments will grow at a slightly lower 22.2% rate as system prices fall a bit after a major uptick in 1995. The region's market blossomed in 1994 and 1995. The Asia/Pacific region (excluding Japan) again represents one of the highest worldwide growth areas, with a 21.3% forecasted CAGR in unit shipments for the 1996–2000 period. The region's market blossomed in 1994 and 1995 and will continue its strong growth pattern with annual increases of 20% through the year 2000.

Asia/Pacific comprises an interesting conglomerate of markets. It is characterized as both an early market and a mature one in terms of its stage of development. The region includes large country markets, such as Australia (the most mature) and Korea (about one-third of the region's volume in 1995), which have undergone tremendous growth and will continue to retain very large proportions of regional market share.

The region is also composed of a group of smaller, economically vibrant countries like Singapore and Hong Kong, which display the attributes of more developed PC markets. Finally, and

Long-Term Accelerators and Inhibitors in the Global PC Market

Accelerators	Inhibitors
Development of lower-cost and more application-specific PCs	Emergence of competing handheld units and low-cost application devices
High-performance processors, including sixth and seventh generation CPUs facilitate "workstation-class" applications	Increased desktop saturation in established markets
Heightened investments from telecommunications consumer electronics, publishing and entertainment industries benefit PCs	Mature state of many regional markets producing low, steady-state growth rates worldwide
Downsizing and continued focus globally on labor productivity and international competitiveness	Limited audience for portable computers
Continued high level of competition among CPU suppliers	Low per-capita income in emerging markets limit development of the home market
PC is the primary access point for the Internet	Cracking the mass buying audience: PC has yet to reach the same level as TV, stereo, or VCR
Advanced multimedia	The cost and utility of PCs inhibits buy-in from a mass audience
Highly competitive market induces constant stream of innovation and product improvements	
Globalization of the home and SOHO market	
Portable computers	
PC servers	

Source: International Data Corporation, 1Q96

most notably, much of the region's growth engine comprises a group of emerging markets: the Philippines, Vietnam, China, India, Malaysia, and Indonesia. Not surprisingly, the most populous markets, China and India, are receiving the greatest attention because of their sizable market potential.

Beyond 1996

The Asia/Pacific region will outstrip worldwide PC growth significantly through the forecast period. PC vendors will turn to this region as a source of offshore manufacturing. Vendors will also look to Asia/Pacific for new market opportunities to offset the expected growth decline in the U.S. marketplace and the more sluggish growth pace in Europe. Although Asia/Pacific will offer ripe growth opportunities, there are still some important market inhibitors, and the largest continues to be the fragmented, heterogeneous status of the marketplace. The Asia/Pacific region is marked by a slew of disparate tongues, cultures, and governments, which translate into a significant obstacle to high-volume growth.

A second obstacle is the relatively high cost of doing business in this region. The existence of fractious, heterogeneous markets precludes the ability to set up a system of significant large-scale distribution. The dominant channel continues to be dealers, and some channel infrastructure is still underdeveloped in lower Asian submarkets. This environment tends to favor established local manufacturers over distant international companies.

The Asia/Pacific market still represents a difficult place to make money in the PC business. Not only are relative business costs higher, with a less-developed logistical infrastructure, but also margins have

become tighter as well. The bulk of the market continues to rest with low-margin desktop products; higher-margin portables and PC servers have not caught on as in other markets. The region also continues to experience a slower technology adoption rate than other markets. Most vendors sell low-margin legacy technology to Asia/Pacific. Australia and New Zealand are the region's most mature markets.

Japan: 1995 in Review

The Japan market was on fire in 1995. With strong support from all segments, it hit nearly 5.8 million units, up from 3.5 million in 1994. In 1995, IDC Japan found that shipments to the business sector increased 63.6%. Factors driving growth in the business market included the continued proliferation of networked PCs, e-mail systems, and groupware as well as increased usage of the Internet and unexpectedly strong growth in the SOHO market.

Shipments to the Japanese home market increased 95% over 1994. Growth was fueled by an increase in PC use among middle-aged users, a major jump in the number of available CD-ROM titles, and increased use of the Internet and related electronic communications. At yearend, the market was also helped by the arrival of Windows 95, which, according to IDC Japan, hit shipments of nearly 1.8 million in only a five-week period.

The Outlook for 1996

The 1996 PC market in Japan is expected to show extremely strong growth. It is pegged to factors similar to those that drove the market in 1995. IDC estimates that unit shipments will rise to 8.4 million this year (valued at $21.2 billion), a huge 44.1% increase in units, which is the largest among the world's major country markets.

Beyond 1996

For the 1996–2000 period, Japan is expected to outpace worldwide growth by a modest rate. The 1996–2000 CAGR for unit volume is forecast at 18.8% versus 13.7% worldwide. Japan's moderating growth is expected to follow a huge increase in volume. Specifically, the volume is projected to increase threefold from 3.5 million in 1994 to almost 11.0 million in 1997. By the year 2000, Japan's share of worldwide volume is forecast to reach 14.4%, a whopping 4.4 jump in percentage points over the 1995 level of 10.0%. Japan's growth through the end of the century is fueled by an acceleration in the adoption of PCs in the home and business to the levels of other industrialized nations.

IDC Japan believes that there is large untapped potential in Japanese households. In 1995, household PC penetration stood at less than 10%; by comparison, the rate in the United States is more than 40%, according to IDC/LINK. By the year 2000, IDC Japan expects home penetration to exceed 44% with more than 18 million PCs in use.

IDC Japan also believes that to stay competitive on a global scale Japanese businesses will need to accelerate their adoption of PCs. Currently, PC penetration rates of employees in business stands at 14.1%. In addition, Japan lags far behind in installing networked PCs. IDC Japan estimates that only 35% of installed business PCs are connected to a network; this compares with 85% in the United States. By 1997, IDC Japan forecasts that shipments to the business segment will reach 6.6 million, expanding the penetration rate to 27.8% and helping narrow the PC-in-business gap versus the United States and other global economic powers.

The Rest of the World

The ROW "region," composed largely of Latin America, Canada, Eastern Europe, and the Middle East/Africa, showed growth of 17.5% in 1995, well behind the worldwide rate of 23.7%. Growth for the region's major geographic components averaged 12–19%: Latin America (15.8%), Canada (15.7%),

Eastern Europe (19.2%), and Middle East/Africa (12.0%). Total unit volume rose to 8.5 million, which equated to 14.7% of worldwide volume.

In 1996, growth rates are expected to drop slightly to 16.0%. On the one hand, the rebounding Mexico market is expected to lift Latin America back on a faster growth track with 1996 volume projected to increase 20.6%. On the other hand, growth in Canada and Eastern Europe is expected to slow. The Middle East/Africa region is expected to show about the same rate of growth as in 1995.

For the 1996–2000 period, the ROW group of countries is forecast to increase shipments at a CAGR of 14.6%. Leading the pack of countries will be Latin America, which is expected to post the same growth rate as the Asia/Pacific region's 21.3%. Eastern Europe is expected to show the second-fastest pace at 12.8%, followed by the Middle East/Africa (12.5%). Canada will show the lowest at 10.6%.

Vendor Wrap-Up: The Watchword Is Segmentation

The worldwide PC industry is entering a brave new world of segmentation. Technological advance and market maturity are converging to the point that product differentiation is regularly creating new categories. Market segmentation is in principal a function of market maturation; as the industry develops, vendors will begin to craft product offerings to specific market segments to continue market expansion. Added to that dynamic is the pace of technological change and the price reductions of advanced components. Each major PC product category, desktops, portables, and consumers now claim multiple subsegments.

Vendors first began segmentation with software bundles for the consumer line that were different from the commercial line. However, most vendors now design product lines separately for the commercial and consumer markets.

Vendors are now beginning to segment further their retail and consumer offerings. PC manufacturers like NEC, IBM, and Packard Bell late last year began to offer special game PCs with premium graphics accelerators, a bundled joystick, name-brand speakers, and software bundles full of popular games. This trend of "boutique PCs" will continue this year, especially as 3D rendering engines begin to enter the OEM market.

In the desktop world, the pace of competition, innovation, and technical change will continue to accelerate. The entrenchment of the Internet and multimedia will lead to a focus on providing technologies to advance those applications. In addition, the competition will grow more complex and likely combative with the entrance of Sony and Toshiba into the category.

On the commercial side of desktops, there are a couple of impending developments. In 1996, the highlight will be the renewed war between PCs and workstations. Vendors will focus on improving overall systems performance and cost of ownership. On the competitive front, the activity will feature much bigger players including Compaq, Hewlett-Packard, and Dell. All of these vendors reinvigorated their efforts in 1995.

In 1996 and beyond, these dynamics will challenge the flexibility and resilience of PC manufacturers. A shuffling of the top five players, even from year-to-year, is inevitable, but precise predictions of winners and losers is always risky. We follow with a brief look at the issues facing each of the top ten vendors of 1995 in the U.S. market.

Hewlett-Packard

Hewlett-Packard gained significant market share in 1995, with global market share exceeding 3.5%. It was the second-fastest-growing vendor in the top 10, and it has a lot of room to expand in consumer desktops and in portables. A fair segment of that growth spurt can be attributed to the

successfully launched Pavillion consumer line. HP has realized significant momentum in the U.S. desktop market since last fall's full introduction of the Pavilion line.

In 1996, HP will also begin to market the Pavilion line outside U.S. borders. This spring, HP will introduce the Pavilion line into Canada, France, Germany, the United Kingdom, New Zealand, and Australia. The company has carefully selected these areas to reflect mature home markets where the Pavilion home line will have a large propensity to succeed. In 1995, the company grew to the sixth position in worldwide share ranking while the new Pavilion line sold only in the United States. The internationalization of the Pavilion will further advance HP's global competitive position in the desktop market.

Acer

For 1995, Acer was the fourth-fastest-growing vendor in the top 10. Its strong growth has been fueled by an impressive performance in the U.S. consumer desktop arena. Acer has an interesting business model. It is highly localized, but it also taps into a tremendous capacity and engineering capability back in Taipei, where it is headquartered. Acer is doing well in the U.S. market and is also starting to expand in Asia/Pacific.

However, to achieve its avowed intentions to become one of the top five vendors in the United States, Acer America must grow all its segments, including the commercial. A recent reorganization in which the vendor split itself into autonomous commercial, consumer, and OEM/systems integration units to ensure internal competition made plain its intentions to do just that. To that end, the vendor is renewing its commitment to the channel. Expect Acer to be an aggressive player in the U.S. retail market as it vies for vital shelf space.

Compaq

Compaq continues to boast a strong business model, highlighted by a well-diversified product line, global reach, and consistent record of strategic execution. The company has shown a consistent ability to refresh and expand product lines to both meet and set competitive benchmarks. In recent years, the company has solidified its corporate product line with advanced, usable subsystem features such as Intelligent Manageability. The success of its LAN server products has further bolstered its image in corporate circles. While building the high end of its business, the company has sought to keep up with the competition in other segments as well. Still, in 1996 Compaq must fix its weak link in portables.

Compaq's most enviable position remains its profitability. Even with its diversification and globalization, it still generates more profits than anybody else. The company is committed to maintaining solid margins. Although margins dipped in the last quarter of 1995 and the first of 1996, Compaq will not easily surrender to what is the norm for almost everyone else. As the year unfolds, price cuts, inventory reductions, and falling component prices will keep the pressure on.

Dell

Dell has ridden the rollercoaster in terms of market share the last couple of years, but stability may be on the horizon. The company has reaped share gains from an improving performance in commercial desktops and portables. Now it must expand into the server market in order to remain on track for profit and share growth. Further globalization would go a long way to stabilizing market share. To that end, Dell announced in April 1996 the commencement of direct sales operations in both Taiwan and South Korea. In South Korea, it has established a customer service center in Seoul to headquarter its technical support staff, a direct sales force, and a call center. It

Worldwide Portable PC Unit Shipments (000), 1994–2000

	1994	1995	1996	1997	1998	1999	2000	1996–2000 CAGR (%)
Small Notebooks								
United States	336	283	350	411	480	554	633	16.0
W. Europe	135	98	142	184	224	268	316	22.0
Japan	183	618	925	1,226	1,484	1,720	1,903	19.8
Asia/Pacific	39	39	72	105	128	149	163	22.8
ROW	26	28	42	56	75	99	120	30.0
Worldwide total	719	1,066	1,530	1,981	2,390	2,790	3,135	19.6
Notebooks								
United States	2,864	3,286	4,045	4,911	5,873	6,795	7,686	17.4
W. Europe	1,746	2,090	2,404	2,746	3,089	3,453	3,839	12.4
Japan	926	1,147	1,692	2,227	2,676	3,078	3,403	19.1
Asia/Pacific	479	676	857	1,056	1,341	1,679	1,967	23.1
ROW	625	661	881	1,173	1,536	1,947	2,312	27.3
Worldwide total	6,640	7,860	9,878	12,113	14,515	16,952	19,207	18.1
Total Portables								
United States	3,200	3,569	4,395	5,322	6,353	7,350	8,319	17.3
W. Europe	1,881	2,188	2,546	2,930	3,313	3,720	4,155	13.0
Japan	1,109	1,765	2,616	3,453	4,160	4,798	5,306	19.3
Asia/Pacific	518	715	928	1,161	1,469	1,827	2,130	23.1
ROW	651	688	923	1,228	1,611	2,046	2,433	27.4
Total shipments	7,359	8,926	11,409	14,094	16,905	19,741	22,342	18.3

Source: International Data Corporation, 1996

will also employ technical support teams, direct sales forces, and a call center in Taiwan.

In fact, Dell's targeting of the Asia/Pacific region is timely, if not prescient, given the burgeoning of that regional market. The company has followed a blazing expansionary policy into the Asian markets. In 1994 it was one of the fastest-growing PC vendors in the region and grew its business significantly. In 1995, Dell began construction early on a manufacturing facility in Malaysia to build desktops and assemble notebooks for the local markets. It also established itself in other Asia markets, including Malaysia and Singapore during 1995.

Fujitsu

Fujitsu/ICL is an interesting combination of Fujitsu, a Japanese vendor that owns 80% of ICL, which is based in Finland. It made it into the top 10 for the first time because of Japan. It was the fastest-growing vendor among the top 10 in 1995. Fujitsu set off a shock wave in Japan by lowering its prices substantially and subsequently gained tremendous market share. ICL also enjoyed a stellar year in Europe. In 1996, Fujitsu/ICL will seek to expand U.S. market presence by entering the mainstream notebook arena.

On February 15, the company formally announced its intention to enter the U.S. notebook market with the creation

Apple

Apple is under a veil of increasing scrutiny and skepticism. It will need to dodge a number of obstacles in 1996. First, it is restructuring, and it is changing market position. This year will prove to be very difficult for Apple. The firm's restructuring took a serious turn on April 4 when it announced that it would sell its Fountain, Colorado, manufacturing plant to SCI Systems, a large contract manufacturer.

Apple is selling the plant, which employs 1,100, to focus its energy on areas in which the company can add more value and maximize its resources. SCI may be able to assist Apple in its efforts to improve supply-chain flexibility. The company urgently needs to focus on what it does best and find partners to do necessary tasks in which Apple adds little value. We expect more outsourcing announcements from Apple as the vendor proceeds with the reevaluation of its business practices.

Final Thoughts: Home Sweet Home

The home PC market has provided much of the recent growth in PC markets throughout the world. Despite this growth, some characteristics of PCs need to be improved. Currently, the PCs that saturate the consumer base are neither affordable nor utilitarian for many people. Vendors are now starting to offer products, prices, and features that will enable them to capitalize on the global consumer buying audience. The following items will influence the next consumer wave:

- Net PCs
- Expansion into new consumer products
- Lower-cost PCs
- New appliances: set-top boxes, players, PCs in home theater, handhelds

The home market is gearing up for increased globalization; however, the U.S. market is the most mature and probably reveals the future for the rest of the world. Several factors will ensure continued growth in the home PC segment:

- PCs are beginning to penetrate lower-income family households due to the continued low-end focus from Packard Bell and new interest from Acer and Compaq in the low-end desktop segments.
- Online connectivity through the Internet and online services continue to command significant consumer interest.
- Multimedia software content is now compelling; game developers are beginning to write to the PC platform in addition to embedded devices.
- Near-term price erosion in DRAM pricing could stimulate demand.
- Developing technologies such as 3D rendering, MPEG-2, and DVD will pull the replacement market and will likely expand the current one because of greater functionality. The home theater concept could likely grow the PC market to include consumer electronics customers.
- The U.S. economy continues to remain healthy with steady consumer confidence, low unemployment, and low inflation. Few economic reasons exist as to why the PC market will begin to change from previous levels. The U.S. home market has experienced negative growth before, but under different conditions. What brought the PC market into negative growth between 1989 and 1991 was largely the national recession, a sharp decline in consumer confidence, a marked slowdown in price/performance gains, soft penetration of newer technologies, and a slowdown in new application development. These conditions are not applicable today.

THE GRAY SHEET
Computer Industry
REPORT

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LAN Servers on a Collision Course with Midrange Environments

The LAN server market is arguably one of the hottest areas within the overall systems arena. In 1995, the worldwide market grew to over $12 billion and is expected to exceed $26 billion by the year 2000. This market is characterized by intense competition, rapid technological change, and potentially lucrative rewards for vendors who position themselves strategically. During 1995, many new suppliers entered this market, intensifying the competitive landscape and raising the cost of entry. Vendors wishing to be successful in the LAN server market today must not only produce state-of-the-art hardware but must invest significantly in software, services, and partnerships.

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Keeping ahead of the competition, also requires an understanding of the key issues affecting the LAN server market:

- Growth in regions outside the United States and Europe — The Asia Pacific region and Japan will fuel much of the growth throughout the remainder of the decade. Other regions exhibiting high growth rates include Latin America and Eastern Europe. Vendors in the LAN server market must make immediate investments in these regions in order to ensure leadership on a global basis.
- Increasing importance of application servers — LAN servers are being installed for many types of applications. Internet services, light-weight transaction processing, and decision support are future applications that will drive LAN server sales.
- PC servers are a strategic platform — Most customers will buy PC servers as their LAN server platform of choice by the end of the forecast period. Desktop servers will be implemented within only the most price-sensitive markets.
- Competition intensifies as PC servers and super servers move upstream — PC server and super server products will compete increasingly with suppliers and products that they never interfered

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with before. The market will heat up in 1997 when the next-generation PentiumPro servers hit, raising the performance of Intel servers to new levels.

In the years ahead, LAN server vendors will not just be jockeying among themselves for position and share. As new applications and new operating environments infiltrate the LAN server space, they are enabling LANs to move upstream to compete with midrange systems. A tremendous collision between midrange servers and LAN servers is consequently occurring. This collision is having far-reaching consequences — most notably it is impacting the LAN server procurement process.

Once an ad hoc departmental-level activity, this process is now typically centralized, with formal budgeting processes and direct IS involvement. LAN server investments are now much more focused on business productivity rather than personal productivity.

As IS becomes more intimate with the purchase, installation, and management of LANs, LAN server product development, channel strategies, and marketing messages are being affected. During 1996, vendors will begin to roll out systems management products, new rack-mount servers, and redundant hardware components, all key high-end functionality. The development of clustering software will also be important, initially as a means of increased availability, then longer term (1998) as a way to enhance performance. Direct selling teams to work with VARs, expanded ISV relationships, and value-added service and support programs are other strategies that LAN server vendors will employ during 1996 to capture the attention of IS.

The good news is that this collision is creating new selling opportunities for LAN server vendors. The bad news is that this change is occurring amid intense competition from both PC manufacturers and systems vendors. LAN server competitors no longer have the luxury of time to test their future business strategies. As competition intensifies and time-to-market becomes a strategic issue, understanding the implications of a LAN server and midrange market collision will be critical for systems competitors. Vendors without a firm understanding of the changing dynamics within the fast-paced LAN server market will have a tough time competing and even surviving through the turn of the century.

This issue of *The Gray Sheet* assesses the LAN server market, highlighting market dynamics that are changing the competitive landscape. Additionally, we discuss the strategies of the three leading LAN server vendors: Compaq, IBM, and Hewlett-Packard.

Market Dynamics: LAN Servers Come of Age

The LAN server market is becoming an increasingly strategic part of the overall systems marketplace. Gone are the days when LAN servers were used solely as file- and print-sharing devices. Today it is hard to find an application that doesn't run on a LAN server. In fact, LAN server platforms are now being implemented for all types of applications workloads, including processing that formerly resided on midrange systems and even on mainframes.

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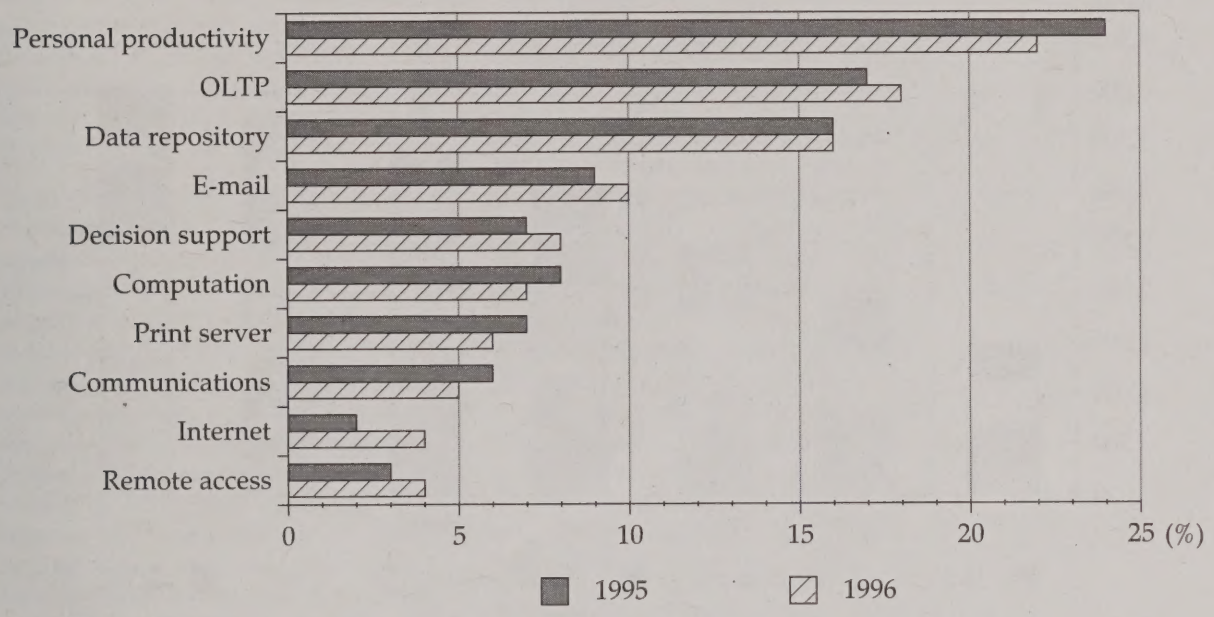
New Workloads on LAN Servers, 1995 and 1996



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Source: IDC's Strategic Configuration Investment Survey, 1995

As new applications are implemented within LAN environments, customers are changing the way they procure and implement LAN servers. At the low end, small and midsized businesses are using LANs as their means for "getting connected." Key applications include file and print sharing, e-mail, Internet services, and remote access. At the high end, customers are considering LANs for many of their IT needs, most commonly collaborative computing (groupware), database, Internet services, and even transaction processing.

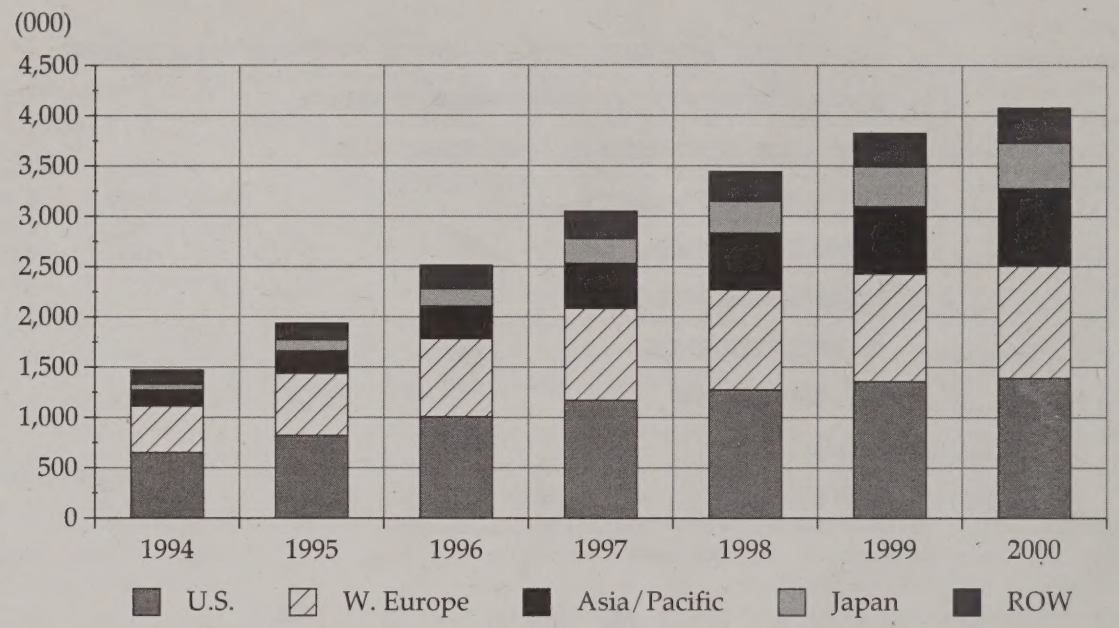
A tremendous amount of new application activity is occurring on LAN servers. In fact, IDC demand-side research reveals that customers are now implementing LAN servers for more than twice the number of applications compared to three years ago. As LAN server platforms develop further, the dynamics within the LAN server market will change significantly. The following section describes the key dynamics that will impact the LAN server market during the next few years, including the implementation of new applications and new operating environments.

LAN Servers Not Just for File and Print Anymore

In the late 1980s and early 1990s, LAN servers were primarily implemented for file and print sharing, and for personal productivity applications. E-mail was the next major LAN application to drive server sales, becoming significant in the 1992 to 1994 time frame. Today, more mission-critical applications such as "light-weight" transaction processing, data repository, and decision support are consuming the processing power of LAN servers. Over the next few years, an increasing number of applications will drive LAN server sales.

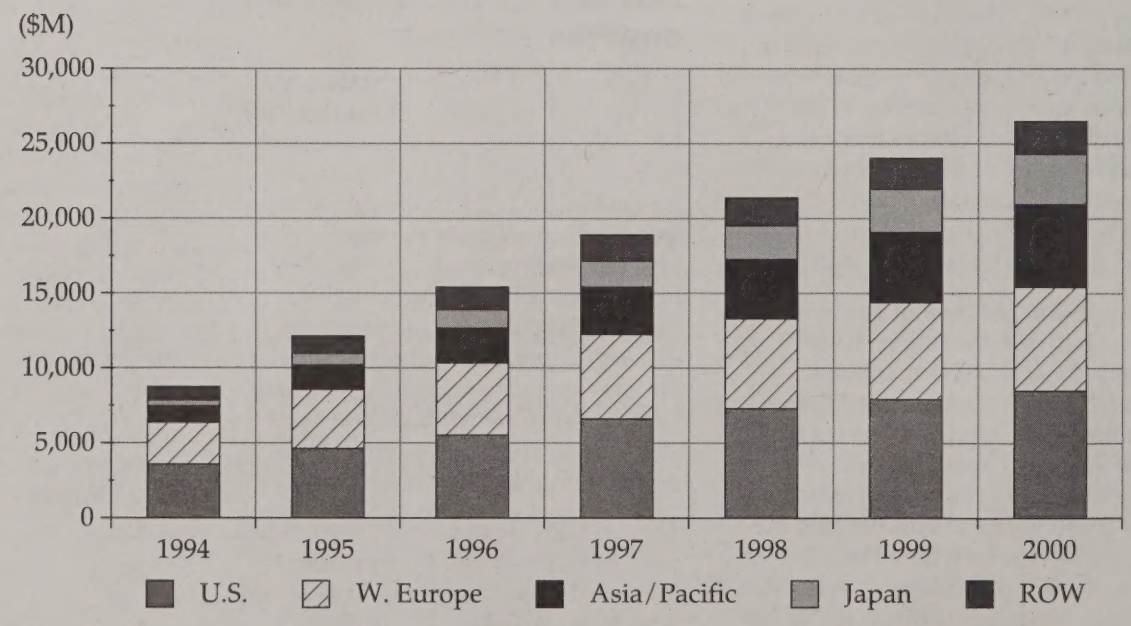
That said, file servers are, and will continue to be, the dominant type of server through the forecast period. In 1995, file servers accounted for 71% of all LAN server shipments, a decrease from 74% in 1994. Future growth within the file

Worldwide LAN Server Shipments by Region, 1994–2000



Source: International Data Corporation, 1996

Worldwide LAN Server Revenues by Region, 1994–2000



Source: International Data Corporation, 1996

server market will be fueled by LAN investments within small and midsized businesses and growing networks within large corporations. IDC believes these two trends will spur healthy growth (11% CAGR) from 1995 through 2000. In the year 2000, file servers will still account for the majority (58%) of LAN server shipments.

Even though file servers will remain the dominant function on LAN servers, application servers will account for a growing portion of the pie. In 1995, application servers accounted for an estimated 29% of LAN servers, an increase from 26% in 1994. Future growth depends on how customers add applications to their LANs. Although customers can implement a variety of strategies — including upgrading, consolidating, and adding new servers — most customers indicate they add new dedicated servers as applications are added to the LAN. Consequently, as customers increasingly add functionality to their LAN investments, application server shipments will soar. By 2000, more than 42% of LAN server shipments will be application servers.

Relatively Stable Application Environments in the Next Year

From 1995 to 1996, customers are not anticipating any major shifts in the application workloads that are on their LAN servers. The most notable increases, however, are Internet, e-mail, and decision support. These applications, along with online transaction processing (OLTP) and remote access, will drive new server sales throughout the forecast period.

New Operating Environments for LAN Servers

In addition to new applications, a shift is occurring within the major LAN server operating environments. NetWare — still the dominant LAN OS software, with 46% of 1995 worldwide LAN server shipments — will constitute a smaller share of the worldwide total throughout the forecast period. IDC predicts that by 2000, NT Server sales will surpass NetWare on LAN servers.

Novell's NetWare will remain a prominent NOS for the next few years because of the sheer size of the installed base of customers, the trained reseller community (more than 100,000 existing CNEs), and the number of applications that are currently available for NetWare environments. NetWare also has the best connectivity to legacy platforms of any NOS, including SNA and DECnet. Additionally, continued growth for file and print environments, especially for small and midsized businesses, will help NetWare sales remain strong.

Microsoft's challenges will be to create robust NT server application environments with the major LAN ISVs. The company gained momentum for LAN application server sales in 1995, with all of the major LAN database software vendors porting their software to NT Server. Microsoft will need to do further optimization within these environments. Microsoft's marketing muscle, control of desktop operating environments, and technology advancements (better scalability and better administration than NetWare) will help the company become the leading NOS environment for LAN servers by 2000.

Heterogeneity will be the rule for LAN server environments throughout the forecast period. NetWare, NT Server, and Unix (primarily for application servers) will all play roles within corporations' IT infrastructures.

LAN Server Market Review and Forecast

The LAN server market is growing at a rapid rate. In fact, this market is the fastest-growing segment within the entire systems market and is one of the brightest growth spots in the PC market.

From 1994 to 1995, the entire LAN server market grew 32% in shipments, to reach almost 2 million servers shipped worldwide. Revenue growth was even more impressive, totaling 39%, to surpass $12 billion. In comparison, IDC estimates that the overall systems market grew slightly (2% to 5%) from 1994 to 1995, and the overall PC market grew 23%.

Continued healthy growth is forecast for the worldwide LAN server market. By 2000, the market will more than double in terms of shipments and revenues. At the end of the forecast period, more than 4 million LAN servers will ship worldwide, valued at close to $26.5 billion. At that time, more than 17 million LAN servers will be installed worldwide.

Competitive Analysis of Key LAN Server Vendors: Compaq, IBM, and Hewlett-Packard

Compaq: Compaq continues to be the leading player in the PC server and super server markets. The company has been untouchable for the past few years in this market and Compaq will maintain leadership in 1996. However, in 1996 Compaq will face its most competitive year, with HP and IBM gaining significant momentum in this market. In 4Q95, Compaq began to experience this pressure when shipments shrank 5% from the previous quarter. Compaq announced it will be implementing price cuts and increased promotional activity to help growth in the upcoming quarters.

Product Lineup

In 1995, Compaq shipped 302,600 units of its PC servers and super servers. The company's best selling server was its low-end ProSignia 300, which shipped 93,800 units. This server was not only Compaq's best seller but also the best selling server in the overall LAN server market. On the high end, Compaq refreshed its ProLiant family to include the ProLiant 1500 and ProLiant 4500. Compaq phased out older ProLiants (1000, 2000, and 4000) and ProSignias (original models and VS).

Compaq's current server line-up includes the following models:

- ProSignia 300
- ProSignia 500
- ProLiant 1500
- ProLiant 4500

Future Strategic Direction

The following represent an assessment of the strategic direction Compact will take to increase its leverage in the LAN server market:

- Aggressive PentiumPro (P6) adoption
- Service and support infrastructure investments
- Expand ISV recruitment with e-mail and remote access suppliers
- Strengthen relationships with Lotus and SAP
- Expand Internet server bundling options to include security software
- Clustering

IBM: IBM remained the number-two player in the combined PC server and super server market worldwide. The company showed marginal growth in the first three quarters of 1995, but exploded in the fourth quarter with shipment growth of 56%. IBM's strong fourth quarter was the result of developing strong system management software, moving toward industry standard technology (PCI/EISA), changing channel strategies to alleviate conflict, and a much more aggressively positioned low-end offering. IBM will be the server company to watch in 1996.

LAN Server Segmentation

Server Segment	Definition	Examples
PC desktop server	A PC desktop implemented as a server; these products are most likely configured as desktops and can be nondedicated or dedicated.	Compaq DeskPro HP Vectra IBM PS/2 or ValuePoint Running shrink-wrapped LAN NOS software
PC server	A uniprocessor PC, sold, marketed, and built as a server. These products are typically configured as servers.	Compaq ProSignia 300 and 500, ProLiant 1500 (in 1995) HP NetServer LC and LF IBM PS/2 Server 95, and PCServer 300, 310, 320 (in 1995), 500
Super server	A multiprocessor PC, sold, marketed, and built as a server.	Compaq ProLiant 4500 IBM PCServer 720 HP NetServer LH and LS All NetFrame servers
Dedicated midrange server	Midrange systems running a shrink-wrapped NOS and dedicated to LAN services.	Digital Alpha HP 9000 Series 800 IBM RS/6000 and AS/400 Sun SPARCserver. These systems must be dedicated and running shrink-wrapped LAN NOSs like NetWare or NT Server.

Source: International Data Corporation, 1996

Product Lineup

In 1995 IBM had an impressive year, shipping 121,250 PC servers and super servers. IBM refreshed almost its entire product line last year to include these following models:

- PC Server 300
- PC Server 310
- PC Server 320
- PC Server 500
- PC Server 520
- PC Server 720

IBM has also announced a new PentiumPro server, the PC Server 704. This server is scheduled to ship in June 1996.

Future Strategic Direction

The following represent an assessment of the strategic direction IBM will take to increase its leverage in the LAN server market:

- Early PentiumPro rollout in June/July 1996 time frame
- Reposition NetFinity as reseller support package
- ISV partnerships with initial focus on Lotus and Microsoft
- Solutions orientation to Internet servers

Hewlett-Packard: HP showed strong unit growth in 1995 especially in the fourth quarter. In 1995, the company made many strategic changes and improvements to its product line in order to better compete with IBM and Compaq. HP introduced new set-up and configuration software, Navigator, and introduced its first four-way super server, the NetServer LS. Although HP did not gain any market share in 1995, the company was a formidable competitor in the PC server and super server market, and has the opportunity to battle IBM for the number-two position in 1996.

Product Line Up

HP introduced two new models in 1996, the NetServer LH and the NetServer LS. The NetServer LS is HP's flagship PC server. The LS, which was introduced in the third quarter, was met with a strong reception from the market and ramped impressively in the fourth quarter. The LH which can be configured as a two-way machine, also had a successful introduction at the end of the second quarter. HP's current product lineup is listed below.

- NetServer LC
- NetServer LH
- NetServer LS

Future Strategic Direction

The following represent IDC's assessment of the strategic direction HP will take to increase its leverage in the LAN server market:

- Refocus on low-end
- Evaluating software distribution via Navigator
- Leverage ISV programs from 9000 division
- Clustering announcement in the works

Note: This issue is adapted from IDC's 1996 Analysis of the LAN Server Market, *(IDC #11394). For inquiries please contact Susan Frankel at 503-035-4132.*

THE GRAY SHEET
Computer Industry
REPORT

Global market intelligence on the information technology industry since 1964.

Meet the Intranet: Corporate Webs and Maybe the Next Thing in Client/Server

The rising public and corporate interest in the Internet is encouraging a growing number of users and software developers to evaluate browsers and the World Wide Web (WWW) as components for distributed applications in tomorrow's private corporate networks. The most widely used term to describe this phenomenon is "intranet." Like the term "client/server" in the early 1990s, intranet means many different things to many different people, both users and IT vendors.

Many IT vendors' current efforts to position products for the corporate intranet fail to recognize that there are several distinct markets for solutions that employ browsers and web servers. Some users view an intranet as a new electronic document infrastructure; others consider an intranet to be the foundation for a new generation of client/server-based transaction and decision-support applications. Finally, many IS orgainizations see an intranet as a TCP/IP based enterprise network infrastructure. These markets are very different in terms of functional requirements as well as target-customer base. Successful vendors must package intranet solutions and develop appropriate sales channels to meet user needs in each specific segment.

In an effort to move beyond the nebulous and overly broad term intranet, we identify several separate markets in which the technologies associated with intranets will directly influence future product design and user implementations. These include:

- Enhancement (or replacement) of current file and document sharing systems with a new collaboration and electronic document infrastructure (a corporate web)
- Development of WWW and browser-based solutions that improve the scalability and manageability of transaction and decision-support applications designed for client/server or legacy systems (intranet client/server)

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Vendors that emphasize the overly broad area of "intranet" in product development and sales risk missing the more specific and real opportunities in these distinct market areas.

This issue of *The Gray Sheet* discusses why intranets, as well as the specific markets for corporate webs and intranet client/server, are suddenly so important to users and IT vendors. It also describes the underlying features of the emerging segments mentioned above and examines how adoption of alternative intranet solutions will affect current products and the vendors that sell them.

What Is an Intranet?

At its most basic, an intranet is a private TCP/IP network that may or may not be connected to the Internet. Management of TCP/IP addresses and all dependent services is the responsibility of internal network administrators. If this intranet is connected to the Internet, there is typically at least one firewall in place to prevent intrusion from outside and/or to control internal users' access to the outside world.

Under this definition, companies have been building and using intranets for well over a decade. Two factors have brought the intranet concept to prominence over the past year: the TCP/IP enterprise and the Internet-derived platform.

The TCP/IP Enterprise

The number of systems and networks running TCP/IP in organizations began to rise sharply in the early 1990s. In 1990, TCP/IP networks in most organizations consisted of Unix workstations, a few connected PCs, and some TCP/IP-based minicomputers supporting asynchronous terminals. By the end of 1995, more than 16.7 million business PCs used TCP/IP for network transport.

Not only has the absolute number of TCP/IP systems grown, but more companies are deploying TCP/IP networks in their organizations. In IDC's December *1995 Strategic Configuration Investment Survey* of 966 U.S. midrange system sites, more than 57% of respondents stated that TCP/IP was their primary network protocol for client communication. The combination of greater numbers and broader TCP/IP deployment makes it possible for users to envision a time when all (or at least most) of the systems in their enterprise will be on a TCP/IP network (i.e., an intranet).

The Internet-Derived Platform

The second and more important factor is that companies are increasingly looking to TCP/IP-derived tools (e.g., SMTP mail, Telnet, browsers) and higher-level services (e.g., WWW and network news) as foundations for building internal business applications.

Prior to 1994, companies used TCP/IP as a basic transport underneath custom applications developed in-house or acquired from a database or application vendor. For example, many client/server applications built using products such as PowerBuilder access an RDBMS on a

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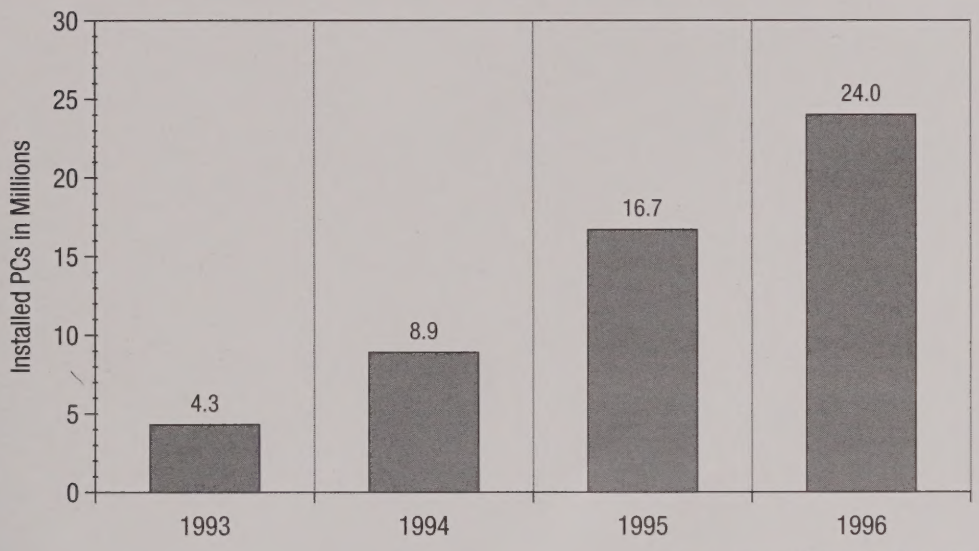
Worldwide Installed Base of Business PCs Using TCP/IP, 1993–1996



Source: International Data Corporation, 1996

Unix server. Thanks to the Internet (the nursery and testbed for applications such as SMTP-based e-mail and WWW), users increasingly view the entire suite of TCP/IP- and Internet-derived software as a potential platform for enhancing current business applications and creating new ones.

As is often the case, however, people tend to focus on the broad general concept of "intranet" rather than try to identify specific areas where an intranet platform can have a direct impact on product design and user implementation. Users don't purchase concepts; they purchase solutions. Any intranet offering must meet one or more specific needs better than an alternative to succeed.

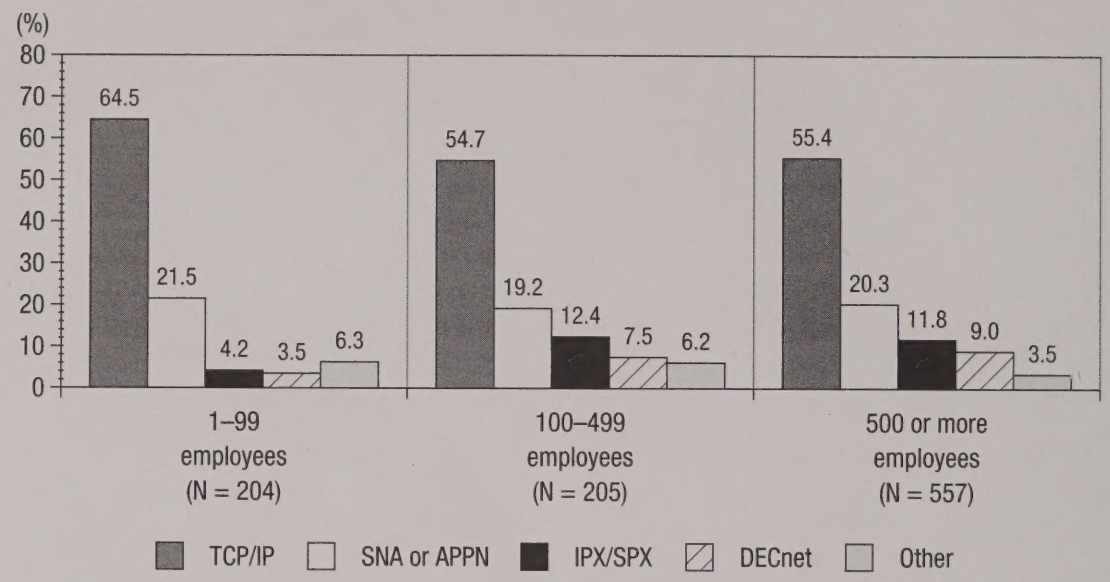
Corporate Webs

One of the most widely used network services in most organizations is file sharing. The primary purpose behind virtually all early PC LAN deployments (NetWare and AppleShare) was to enable sharing of files and printers. The same was true in the Unix workstation environment where Sun Microsystems' Network File System (NFS) was a critical requirement for users trying to share blueprints or technical designs. Companies have found other uses for networks; however, the sharing of documents, graphics, and data is still a major requirement that demands considerable system and staff resources.

The original goal of the World Wide Web's creator was to devise an easy-to-use system for sharing (and linking) diverse information owned by many different individuals and groups. The combination of a standard document format and hypertext links made the WWW a major success in the research community and ultimately for all users of the Internet.

Virtually concurrent with initial public WWW deployments, leading high-tech companies began to establish internal web sites for sharing technical documentation as well as sales and marketing materials. As browsers became more widely available in these corporations, putting basic human resource and corporate financial information on the corporate web was an easy step. In the most advanced sites, users are looking to the corporate web as the foundation for more sophisticated

Primary Client Communication Protocol in Use at Surveyed U.S. Midrange Establishments by Protocol and Establishment Size



Source: International Data Corporation, 1996

information sharing applications including management of compound documents and Notes-based workgroup collaboration.

Web-Based Electronic Documents

What factors are making WWW technology a possible alternative to current document and file-sharing solutions? Browsers and web servers (with or without more advanced functions such as Java) bring several new capabilities in comparison with today's solutions. These include the following:

- A method for universal access that uses a common set of file formats, is independent of any specific operating system, relies on a common network, and is readable by a growing number of applications
- A standard approach for creating and managing electronic documents consisting of web pages, graphics, data fields, and the hyperlinks that tie them together
- A tight connection with messaging technologies that make it possible to link interactive documents to collaboration and transaction systems

In a corporate web, browsers with integrated helper applications (or what Netscape calls plug-ins) replace word processors, presentation software, and even spreadsheets as the primary user interface on desktop computers, and web servers become the primary file servers for storing information (several companies such as Visual Components and Object Power have already announced plug-ins that emulate and are compatible with Excel). Rather than creating and viewing files of information in different formats that are physically and logically isolated from each other, a corporate web gives users an easy way to cooperate in the creation and viewing of hyperlinked electronic documents across many different systems.

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Elements of the Corporate Web

At an abstract level, the corporate web concept appears to be a threat to every desktop suite and file server vendor with an installed base. In the harsh light of reality, however, users in a corporate web still must create documents using something like word processors and graphic packages, and all the information needs to be stored somewhere in a managed file system.

Companies will need new solutions that help them manage links between documents whether they are written in HTML, Adobe's PDF, Microsoft's Word, or another portable electronic document format and stored in a Netscape, Microsoft, Novell, or a competitive WWW server. They will also look to the VARs and integrators that installed their current file-sharing systems to assist in the migration to a corporate web.

Intranet Client/Server

File sharing and compound documents are important, but in many corporations, the most critical applications focus on transaction processing and decision support while concepts such as data warehousing and data mining are emerging as important new development areas. Today, these applications are built either on legacy mainframe systems or (increasingly) on client/server applications with PCs and Unix- or NT-based databases.

Legacy mainframe systems have the advantages of high reliability, strong access control mechanisms, and relatively low administration costs compared to equivalent distributed applications. Unfortunately, the user interface on most legacy systems is excessively complex (even with a graphic front-end running on PCs), applications are difficult to create, and altering any element of the application without major reengineering is extremely difficult.

Conversely, today's client/server solutions can be quickly and cheaply (at least initially) created and have much more friendly user interfaces. However, they do not scale well; they lack many security and access control features, and they are expensive to maintain over the long term. One of the most significant factors contributing to this expense is the cost in time and resources of upgrading all of the distributed client software whenever changes are made in the application.

As users build applications that draw on ever more diverse data sources, they need a solution that offers the ease of use and flexibility of current client/server solutions combined with the scalability and administrative efficiency of traditional centralized solutions. More important, they need a solution that leverages all of their current investments in networks, clients, servers, development tools, databases, and applications. Browsers, web servers, and other Internet technologies employed in an intranet offer a potential solution to this challenge.

Intranet Information Retrieval

Building client/server applications using the facilities of a corporate intranet has consequences for vendors of current host access and client/server development software. Today, accessing mainframe-based information requires one or more gateway servers plus multiple host-access products on all clients. Client/server applications employ a Unix or (increasingly) an NT database running on one or more servers and client software developed with tools such as PowerBuilder. In some cases (e.g., SAP) a single vendor delivers both server and client components; however, considerable integration and design work is left to the user or an integrator.

Intranet client/server applications would use a browser as the standard user front end while the actual presentation logical and interface design

resides on a web or Internet (e.g., news, SMTP, FTP) server. This server communicates to all back-end databases and manages all queries, transactions, and (in the case of mainframe applications) sessions.

Implementation of client/server applications based on Internet technologies offers several advantages for application developers and administrators compared with current solutions. These include the following:

- User access to all information types through a single interface rather than having to navigate diverse and often incompatible legacy application and database interfaces
- Accommodation of rapidly changing information such as live data feeds through a tight connection with messaging technologies
- Developer control over user interface and presentation rules that shorten client/server development/deployment times
- Central administration of user access rights and restrictions that make Internet-based client/server applications more scalable and easier to manage

This conceptual approach to developing client/server applications is not new. It is almost identical to the approach advocated by the developers and users of X Windows technology in the late 1980s and early 1990s. It is also very similar to the three-tier client/server model advocated by leading minicomputer companies in the late 1980s. Neither of these approaches succeeded beyond a small highly specialized customer base, however, because they typically required specialized hardware and/or proprietary software.

Intranet client/server shows much greater promise of becoming a mainstream solution thanks to the broad acceptance and deployment of the underlying network infrastructure (TCP/IP) and information technologies (browsers and WWW) upon which it is built.

Building Intranet Client/-Server

Delivering host and client/server applications built on an intranet framework will require significant changes in both client and server software. Some of these changes call for only additional network and data format support while others will necessitate major changes in user and administrative interfaces.

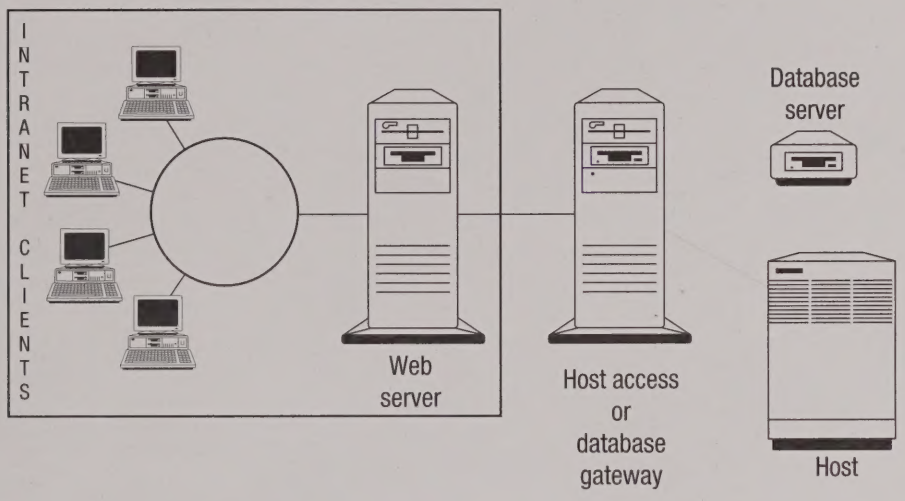
Whatever technical changes come to pass, users will demand that they be able to reap the maximum return on previous and current client/server application design and software development. They will also look to suppliers that leverage this new technology while providing solutions geared to their specific business requirements.

One approach to connecting mainframes to an intranet solution is to use a web server with common gateway interface (CGI) scripts as a gateway between browser-based clients and back-end data sources. This strategy enables a user to leverage current investments in web servers and the rudimentary access control structures already in place. It does require, however, additional software to tie the web server to the back-end data source.

Today, there are two different approaches to connecting the mainframe-based data to the web gateway:

- Add communications functions to the back-end data source (e.g., IBM's addition of web support to DB/2 and CICs) that enable it to directly communicate with a web server
- Integrate preexisting host gateway software with web server software (e.g., Tuebner & Associates' Corridor for 3270/5250 to HTML translation and Microsoft's integration of its Internet Information Server and SNA Server for NT products).

Web Gateways for Intranet Client/Server



Source: International Data Corporation, 1996

This same approach with slight modifications works for accessing Unix and NT RDBMs servers as well. Microsoft's Internet Information Server (IIS) and Internet Database Connector (IDC) are good examples of such a web gateway. The IDC provides an ODBC interface for interface design and connects on the back end to most SQL databases. FTP Software is incorporating similar database integration in its new NT-based Web server.

This web gateway strategy has major limitations as the volume and types of transactions become more complex. It relies upon the current web model where the client system initiates all queries and requests for updates and usually requires the actual presentation rules for the client component to be written in HTML. This restriction makes it impossible for users to leverage preexisting client code developed with tools such as PowerBuilder and Visual Basic.

A small startup, Wayfarer Communications, is addressing these potential limitations through the use of messaging rather than web (i.e., HTTP) software. Wayfarer's solution allows users to employ standard browsers as clients but connects them to an "Internet applications server" called QuickServer.

The QuickServer solution includes extension for Visual Basic, C++, PowerBuilder, and (in the future) Java. Users design the client interface with these tools, but the code resides on the server rather than on every client. QuickServer also employs a messaging interface where the server automatically updates all appropriate clients, thus dramatically reducing polling and network overhead. Since this solution is server based, administration of business logic and user access is less expensive and centralized.

The transaction and decision support solutions that will drive the intranet client/server market are often the most critical business applications. Users will not casually throw out software that plays such an important role in day-to-day business operations. Conversely, they will eagerly evaluate any solution that enables them to more effectively use this information.

Two primary channels for intranet client/server solutions should emerge. In many large accounts with a transaction focus, users will look directly to leading IT hardware (e.g., Digital, Hewlett-Packard, IBM, Sun Microsystems, etc.) and software (e.g., Lotus/IBM, Microsoft, Novell, Oracle, etc.) vendors as well as large systems integrators. Users will also look toward the VARs that helped them implement current client/server applications for accounting, decision support, and human resources. Vendors that supply products to these VARs must deliver new products that help developers and end users meld their current client/server investments with emerging intranet-based implementations.

Constructing the Intranet

Finally, corporate IS will deploy and maintain the underlying network infrastructure of intranet client/server. It will require significantly better administration and performance management than is currently available to effectively meet corporate expectations.

Given the critical nature and complexity of these information-intensive applications, IS will also play a much greater role in the actual purchase and design of intranet client/server solutions. Basic database query functions are useful at all levels of an organization; however, applications that seek to integrate mainframe-based information or deliver enterprisewide capabilities call for extensive IS management supervision even when the primary users are in a single department.

Capitalizing on Intranets

The concept of an "intranet" means different things to both users and IT vendors. At its most basic, it connotes a migration of internal corporate networks to TCP/IP and associated applications, the same protocol underlying the public Internet. For others, "intranet" represents a set of new computing and networking technologies (e.g., WWW and Java) that will force software developers to redesign their applications and users to rebuild their networks. As in the case of client/server, winning the war of definitions doesn't mean anything. Delivery of a solution that helps users meet a current need better than the alternatives is the real measure of success.

Each of the potential market segments, corporate webs, intranet client/server, and the corporate intranet infrastructure presents significant revenue opportunities for established hardware and software vendors as well as new entrants. All segments may ultimately rely on similar technology; however, the customer base and specific needs of users in each segment are very different. To successfully address either segment, vendors must create separate product packages geared for the unique requirements of the corporate web or intranet client/server applications. They must also develop sales and marketing strategies that best meet the needs of very distinct customers.

Vendors that concentrate their development and marketing efforts on the overly broad area of "intranet" rather than addressing the unique technical and sales issues of the specific implementations risk losing out to more focused competitors.

This issue was adapted from IDC's report #11129, "What is an Internet and Why Should your Care?". *For more information contact Rick Villars at 508-935-4599.*

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Computer Industry
REPORT

Global market intelligence on the information technology industry since 1964.

Netscape Takes On the Microsoft Empire: Will JavaSoft Open a Second Front?

Major IT technology transitions wreak havoc on the status quo. Scalable Unix solutions and PC networks sealed the fate of most proprietary midrange environments and even humbled high-cost proprietary mainframes. The PC has changed everything, from the cast of IT players to the ways people use technology.

The latest technology turn is being driven by the Internet. As a result, Microsoft's once seemingly unassailable claim to the desktop is for the first time under assault. The challenge has appeared almost out of nowhere, riding the surprising wave of the Internet and accompanying technologies.

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As the leading representative of the Internet software community, Netscape has emerged as the first real threat to Microsoft's industry dominance. Initially, Netscape was portrayed as a white knight that preempted Microsoft's own designs on the Internet market. Now Netscape is using its early position to push an alternative client "platform" based on its World Wide Web browser. The company is boldly trying to reapply the Microsoft blueprint: first establish a broadbased user interface and then control the application programming interfaces (APIs).

The industry excitement around Internet/intranet alternatives to more traditional client/server application topologies is very real. Thus, Netscape is a legitimate threat to Micorsoft's position as the company that sets the API rules in client software.

Netscape is not the only company dreaming of playing David to Microsoft's Goliath. In 1995, Sun Microsystems released Java, an application development tool for creating Internet applications. In just one year, Java has caused such a stir that Sun created a business unit, JavaSoft, dedicated to promoting the technology. Java is now heralded as a comprehensive application development environment for all environments, a direct challenge to Microsoft's Visual Basic.

The Gray Sheet

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In April, a collection of systems and OS companies announced that they were licensing technologies from JavaSoft to enable Java-based applications to run natively on their operating systems. Almost every major software and hardware vendor has licensed Java, so the language has attained and maintained a momentum of its own. That said, to date there is a scarcity of Java-developed applications that solve real-world business problems. Java is not an operating environment, nor a complete application platform. Java could be the tip of a new architectural iceberg — however, there is not a full component architecture below that tip . . . yet.

The meteoric rise of the Internet has placed the spotlight on the technologies and companies that have helped spur and extend that growth. Netscape and JavaSoft stand out, and their products and technologies are marked for success beyond the Internet. This issue of *The Gray Sheet* takes a close look at both players in their roles as giant killers. First, we examine the core strategies driving Microsoft and Netscape as they attempt to establish themselves as the leader in client/server core technology. This is followed by a first-year review of Java that takes a critical look at JavaSoft's evolving strategy as well as Microsoft's response.

The Battle Lines Are Drawn

APIs are possibly the major source of industry power and leverage in software. "Whoever controls the programming interface controls the programmer," is perhaps a little simplified, but true. The company or companies controlling the development and adoption of the APIs that surround key technology foundations have extremely powerful leverage over the industry that is creating applications using those foundations — over the ISVs and IS developer community. It is the closest thing to proprietary vendor lock-in available in today's open-system world.

In client platforms, another rule applies: "Whoever owns the user interface owns the user." The UI is the fundamental contact point for a software company with its end user and is also a powerful base on which to build brand familiarity. Increasingly, the UI consumes more effort in terms of development — coding as well as R&D and innovation — by application developers.

Netscape is essentially trying to recreate Microsoft's original strategy — to leverage its position as a dominant supplier of a popular user interface to create a position as the dominant player of a set of programming interfaces. Netscape has introduced a new UI in the form of its adaptation of the Mosaic Web browser, and is driving APIs embodied in its proposed extensions to the HTML (Hypertext Markup Language) prevalent on the Web and in its Plug-In architecture. Netscape is a much bigger threat than, say, Apple or IBM because those companies' efforts in operating systems and compound document architectures (OpenDoc) have not aroused the independent software vendor (ISV) interest that the Web has. Web browsers are indeed the latest "killer app."

Netscape's Plug-In architecture for its Navigator browser offers a set of APIs for developers to enable component software such as applications, applets, and viewers. (Viewers allow documents or graphics to

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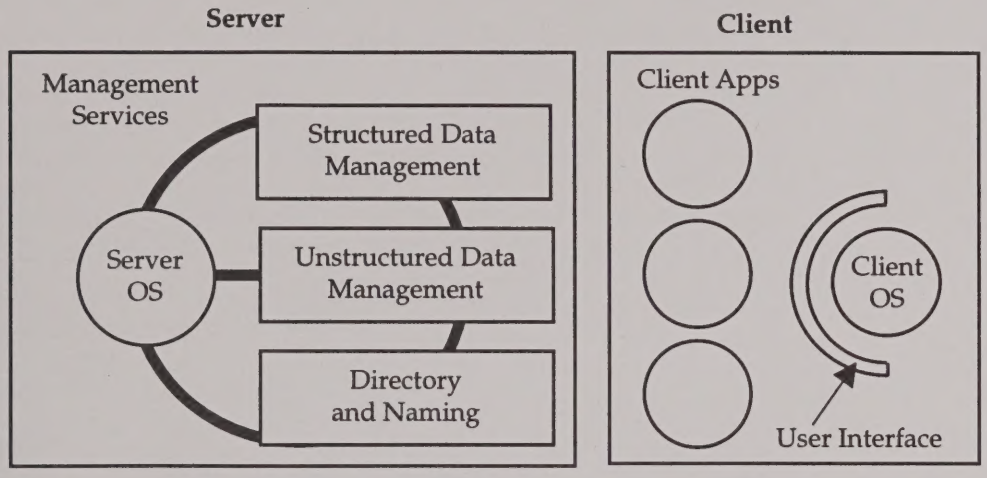
Market Power Leverage Points



Source: International Data Corporation, 1996

be opened without the client running the application that created them, or even having that app loaded.) The Plug-In approach is similar in scope — when it is addressing client components — to Microsoft's ActiveX (formerly OLE) compound document architecture. To date, it is not as broad in scope as Microsoft's overall Distributed Component Object Model (DCOM) architecture.

Both companies are attempting to build positions as the key influencer in client/server software. Microsoft has already shown signs of reactive — even defensive — moves in its posturing in relation to Netscape, indicating that it acknowledges that Netscape is a real threat. (Its "ActiveX" labeling looks like a direct steal from Netscape's "Live" label!)

Another fundamental observation comes to mind in the analysis of APIs and application platform control, one that may have major implications for Netscape's strategies. Companies rarely make money on APIs alone, only on products that are successful implementations of the APIs. Witness the failure so far of 3DO, the game company, in its efforts to thrive by licensing its entertainment platform specification. This company has had to change its strategy dramatically in an attempt to survive and is developing software for its game system — something it originally promised not to do — in order to attract other ISVs.

Finally, applying compound document architectures like OLE and OpenDoc, and of larger distributed computing or client/server technology architectures like DCOM, IBM's DSOM, or the Object Management Group's work to the Internet, is completely legitimate. It's not just some marketing fluff.

Internet software topologies are just another form of client/server, and it is not too much of a stretch to describe a Web page as a compound document. This suitability is one reason Microsoft was able to switch gears so rapidly on the Internet and reposition its existing OLE and DCOM technologies into the Internet-centric, but largely nothing new, ActiveX. This comment is not intended so much as a slap in the face for Microsoft as to point out that the DCOM architecture is suitable for such a role. The same can be said for the other distributed computing technologies.

Clients: Microsoft vs. Netscape

Ironically, Microsoft's own actions on user interface have contributed to Netscape's potential. Certainly, Windows 95 represents major improvements in Microsoft's user interface products, but the company increasingly has been focusing UI activity on the application space. Microsoft's Office help system, for example, is more fully featured than that of Windows 95, and UI innovations such as tabbed dialogue boxes derived from its Excel group. Microsoft has been doing this for a number of reasons:

- While its market share in office suites is roughly the same 85%-plus that it is in desktop OSs, the penetration of Windows suites on Windows desktops is a fairly low 18%. In calendar 1995, Microsoft's revenue (some of it deferred) from Office was $2.8 billion, just about the same as its OS sales. It could gain considerable revenue through an increase in suite penetration if the suite were made the fundamental computer UI and therefore required on every desktop.
- Likewise, Microsoft wants to make the suite rather than the OS the basic client application platform for both financial and somewhat more altruistic reasons. The company argues convincingly that a richer client platform — one that assumed a word processor, spreadsheet, e-mail, presentation graphics, and even a personal database — could better be integrated and customized through component software into true line-of-business client/server applications.

And a case certainly can be made that a user spends more time in applications than in OS functions, so that is where the UI should be.

This "movement" of the UI away from the operating system and onto the application has in part enabled Netscape to insert new UI technologies through its own application, in this case its Navigator Web browser. Netscape's browser at the very least offers Microsoft a challenge in delivering the user experience in navigating around functions and information. Apple is another company that believes the user experience should revolve around tasks and/or data rather than around sometimes artificial PC application barriers. Microsoft itself will stress this approach as it "componentizes" its Office suite functions.

Enter Netscape, with its new UI based on a "killer app," and its Plug-In architecture. Suddenly, ISVs wanting to jump on the hottest bandwagon are considering developing components for Netscape as often as they are for Microsoft ActiveX.

You don't have to believe the world is on the verge of component software and "thin clients" where applets are downloaded from the network when they're needed to acknowledge that Netscape is a threat to Microsoft's client software dominance.

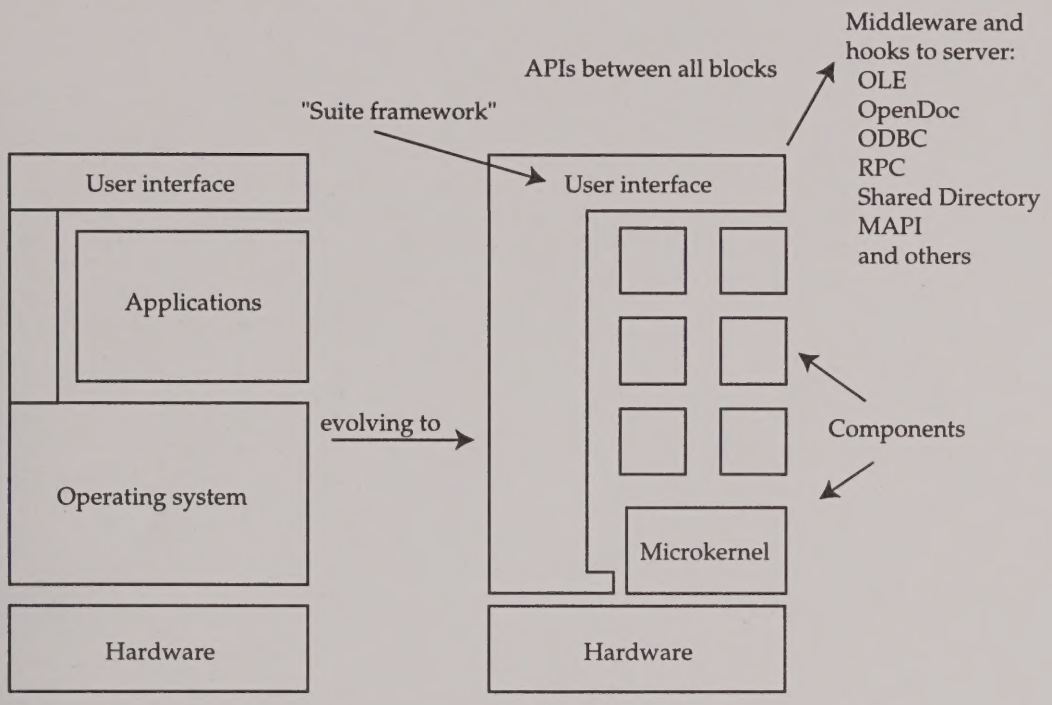
Servers: Microsoft vs. Netscape

Server software industry power can be levered from products and APIs surrounding server operating systems, structured and unstructured data management, directory services, and management services.

Microsoft's NT Server-based BackOffice suite of server components (and they really are services rather than applications) neatly packages concepts of server foundation technologies. BackOffice currently offers SQL Server for structured data management and Exchange for unstructured data. SMS is more of a PC software distribution mechanism than a true network or system management tool, and SNA server, though a useful enabler, is not a foundation technology of the type that would impact the overall software industry.

The major hole in BackOffice is Microsoft's lack of a global directory on the scale of a Novell NDS or Banyan

The Emerging Client "Platform"



Source: International Data Corporation, 1996

StreetTalk. Microsoft originally planned to address this lack with its next generation of NT ("Cairo," now optimistically scheduled for 1997–1998 delivery), which was supposed to include an object file system that could double as a global directory for naming, archiving, securing, managing, and accessing all the resources on the network. Microsoft has recently conceded it can't do all that at once and is rapidly attempting to reset expectations for its directory efforts, promising to integrate Exchange with the Domain Name Server (DNS) technology prevalent on the Internet.

In contrast to Microsoft, and in keeping with its open-system marketing themes (if not its long-term strategies), Netscape currently does not offer any of these core foundation technologies. It does include bits and pieces of the services that make up our foundations, but generally has taken a more solution-oriented approach, often OEMing critical technologies. When it fully integrates the technologies acquired with its Collabra purchase, Netscape may attempt to spread an API-based foundation strategy.

In the near term, Netscape will likely have an easier time succeeding in selling its Internet application servers, particularly for use in corporate intranets. It may be taking an approach more like an SAP than a Microsoft or Oracle, which sell foundation technologies. Eventually Netscape may try to extend the more or less standard APIs that its current product lineup supports.

Consequently Netscape may sell a goodly amount of server applications, but it so far is not establishing the APIs that could give the company a Microsoftlike role in server software. This appears to be a very practical

approach and may help alleviate competition with potential partners like Oracle and IBM.

Market Opportunities

Servers used in intranets rather than as access points to the rest of the Internet outside a company represent the biggest near-term payoff. Companies hoping to take advantage of this intranet client/server opportunity should consider the following:

- Supporting both Microsoft- and Netscape-driven technologies will likely be difficult. They will probably diverge. With the exception of development tools and management suppliers, we advise picking one technology base and exploiting it. Customers are unlikely to spend much money paying vendors to integrate the two, and competitors who specialize in one will have cost and time-to-market advantages.
- Neither supplier has expertise or products that really qualify for online transaction processing. The early efforts of both are much more focused on static data management and "store-and-forward" asynchronous communications. Long-term potential in developing transaction-oriented applications atop either of the two bases will be a major value-add opportunity.
- Both companies are doing a superb job of shrink-wrapping a great deal of client/server complexity — and pricing it aggressively. Suppliers wishing to add value here must realize this beginning and build shrink-wrapped or near off-the-shelf solutions on top of these technology foundations. By integrating development tools and legacy data communication, suppliers will be able to position solutions customized for individual clients or markets.
- Finally, we observe that, for companies more accustomed to direct sales models, intranet solutions will likely continue to be low-cost products initially in nearly shrink-wrapped packaging. This will require, if not alternate distribution channels, at least alternate demand generation techniques. We expect advertising, direct mail, seminar sales, and the Internet itself to be key selling tools.

JavaSoft Struggles to Come of Age

Expressed in human terms, in just one year Java has grown from infancy to adolescence. And like many adolescents, it has a promising future, occasionally misbehaves, and cannot quite manage to survive on its own. To mark the completion of Java's first year as a commercial product, Sun recently hosted nearly 7,000 developers and supporters of its prodigy progeny at the JavaOne Developers Conference. The conference's atmosphere complemented the current mood of Java developers — widespread enthusiasm, sweeping commitment, and massive potential, but little evidence so far of Java ability to create line-of-business applications.

Notwithstanding the industry's enthusiasm about Java, the following points place the programming language in its truest light:

- Despite the hyperbole portraying Java as a language for all seasons and reasons, Java is not yet ready for prime time.
- Having completed the first phase of its evolution/creation, Java now needs the tools that will enable developers to build applications that solve real world business problems.
- As vendors race to release robust tools, developers are relegated to creating "proof-of-concepts" applets running on "fat-client" machines instead of line-of-business applications.
- The widespread adoption of "network computers" and other "thin" clients will assure Java's success at

the enterprise level. Network computers, essentially enhanced terminals, will facilitate a return to centralized computing as well as a revival of interest in mainframes and large minis.

Potential business users looking to Java to solve cross-platform access problems, lower training costs, or reduce hardware expenses have very few products to pick from. Despite the fact that almost every major software and hardware vendor has licensed Java, today most Java applets add just marginal increases in functionality. In addition, most of the Java applets currently available — including some of the winners of the Java Cup competition — tend to underperform and exhibit disturbing instability.

Although a few more sophisticated Java applets and applications are available for niche markets — for example, the financial sector — IT staffers say that currently available applications already do an adequate job of meeting the needs of the enterprise.

Java's immaturity is temporary; however, potential adopters will grow increasingly cool to it if the hyperbole continues to outstrip the reality. One factor that leaves Java struggling to meet currently unrealistic goals is that its supporters offer it as a solution to too many ills. Java's potential benefits include cross-platform compatibility, universal client access, low maintenance costs, and code reuse. What it may eventually do two or more years from now is begin to supplement, then supplant, client/server applications and LANs.

In addition, some Java supporters endorse it as a means to end what they see as Microsoft's dominance of the desktop. One developer compared it to a modern-day version of "The Emperor's New Clothes" parable. "Are we all so desperate for a savior to deliver us from Microsoft that we are chasing after a pipe dream?" he asked.

Microsoft and JavaSoft: Rivals or Not?

How real is the threat Java poses to Microsoft's dominance of the desktop? In recent statements, Microsoft's chairman Bill Gates implied that both Java and the Internet could have a short life. "There's a part of Java that's a fad, just like anything associated with the Internet," he said. Nevertheless, the threat imposed by Java has nudged Microsoft into responding by adding Internet-oriented features to its ActiveX (distributed objects) technology. The new ActiveX tools improve control over an embedded object's behavior and facilitates adding controls to HTML documents. Though Microsoft's ActiveX components and Visual Basic run on Windows-based machines, Java's Component Architecture (a.k.a. Java Beans) works on all common computers, and thus it is better suited for use on the Internet.

A coalition of Java supporters headed by Sun has outlined a two-way conversion of Java Beans into ActiveX and back again. If the conversion process proves reliable, it will provide Java developers with access to a reservoir of reusable, cross-platform, compatible components and an incentive for users of its 3GL programming language, Visual Basic, to also support or maybe migrate to Java. Other Microsoft strategies include promoting Visual Basic as an alternative to Java. VB's widespread user base, estimated at more than 3,000,000 users, could give Microsoft the leverage to keep developers and vendors from defecting to Java.

Java's supporters do Java no service by portraying it as the staff that will eliminate or reverse Microsoft's desktop dominance. Why? In the three markets in which Java can compete, it is a clear winner in two embedded systems and mainframe access via thin client/network computers. In the third, the desktop, Java faces a long uphill swim to replace desktop machines tied into client/server environments. Network managers whose clients have the

horsepower have little to gain from switching to line-of-business Java applets.

Sun would be well advised to position Java as a product for embedded systems where its small footprint and portability allow it to outmaneuver other operating systems.

Fat clients running C++ and Smalltalk applications can already provide Java-like benefits and enable firms to continue to use their existing applications. What overwhelming benefits could encourage enterprise customers to adopt a new technology, deploy new hardware and applications, plus incur retraining costs when the same functionality is already available to them? Furthermore, what motivation could third-party vendors use to persuade customers who have bought and paid for their current client/server hardware and software to move to Java before they have fully amortized their current investment?

The User Perspective

Users who have bought and paid for hardware and software say they have little incentive to switch to a new paradigm. Desktop machines, a.k.a. "fat clients," comprise the majority of desktop boxes. They have the local storage, RAM, and ROM to process data locally and therefore fall well beyond Java's solution profile.

The primary benefits of Java — cross-platform code compatibility, increased interactivity, universal access, and a small footprint — make it ideal for use with network computers to deliver access to mainframes or for use in embedded systems. But not necessarily in memory and storage-laden desktop machines that possess the computational horsepower to process data locally without downloading Java's applets.

Yet the bulk of the technical and marketing statements position Java as a competitor to the titanic assembly of well-seasoned and robust suite of client/server applications, an arena in which Java cannot compete for at least one or two more years.

As one IT manager asked, "Why should I build an intranet? That requires me to port my existing applications into Java. Why ask for problems with so little to gain? Besides, I have an investment to protect."

If developers, vendors of third-party add-ins, and Sun continue to push Java beyond its intrinsic capabilities, Java will fail to achieve widespread credibility in the enterprise.

History Repeats Itself

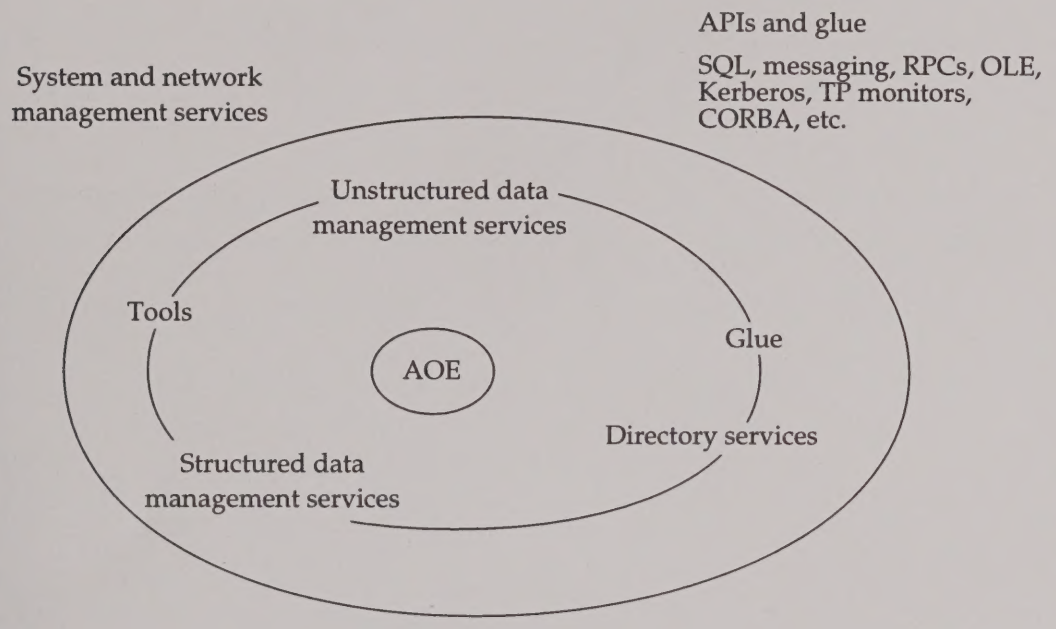
In the rush to embrace Java, we see some of the same elements that existed in the initial surge of support for artificial intelligence, multimedia, and speech recognition. Purchasers' belief in what these technologies would achieve, shaped by the media, vendor press releases, and the unbridled enthusiasm of supporters, created unreasonable expectations, which these technologies failed to fulfill.

Although these technologies eventually achieved some degree of acceptance, customers quickly discovered the limited applicability of such technologies in solving real-world problems. In all cases, as will be with Java, the reality was dramatically different from originally predicted by the technology's supporters.

What will it take for Java to achieve credibility and widespread deployment? It must deliver on the promises Sun initially made for the technology: provide cross-platform universal access to back-end databases.

Today, the majority of Java products are not applications but toolset fragments. Still comparatively few in number, yet soon to multiply, Java toolsets will provide the foundation on which developers will build the Java applications. They will operate in embedded systems where they will exchange data with mainframe databases. Over the next six months, the number, sophistication, and power of toolsets will

The Server Platform



Source: International Data Corporation, 1996

encourage developers to build ever more powerful applications. Over the next 12 months, issues contributing to Java's currently sluggish performance will be resolved. Technical deficiencies such as security flaws and the occasional memory leak will be fixed.

Ironically, even Java's detractors will help increase its integrity. John Williams, product line manager at Sun Microsystems, commented that the security flaws recently discovered by hackers will help Sun to identify where the problems are that need fixing. "Let hackers experiment with and occasionally break the code. That gives our programmers an opportunity to fix it," he quipped. SunSoft, Sun Microsystem's software division, has announced a 3Q96 release of Solstice Workshop, a set of Java-based APIs that will enable network administrators to manage networks over the Internet. According to Sun, Solstice Workshop includes the Java Management API, components for building a management console, and databases compatible with Java and ODBC.

Currently, Java remains closely identified with the Internet even though its technology is equally applicable to intranets. Unfortunately, the Internet suffers from performance limitations, the result of bandwidth constrictions. When combined with the added demand of servicing Java's interpreted and typically graphics-laden object code, a bad situation will worsen. In the near term, Java will have difficulty providing the performance levels that could qualify it for use as a full-time data entry and query system. Nevertheless, with the forthcoming release of "Just in Time" (JIT) compilers, Java could provide some level of transactional interaction. In the consumer market segment this will allow customers, for instance, to search and update selected database fields or documents in their accounts.

In fulfilling this role, Java will help satisfy one of the earliest promises made by Web-based access technology: to provide customers with greater control over their files and simultaneously reduce the cost of consumer support services.

Mainframe Model

One fast track for Java to achieve credibility in the enterprise is for users to deploy Java applications on intranets that use network computing devices linked to big back-end servers. Does this sound reminiscent of a mainframe paradigm? The servers, as they traditionally do in mainframe environments, will provide most or all of the computational horsepower. Unlike the lackluster monochromatic terminals used to access mainframes in the past, the forthcoming crop of low-cost/low-maintenance network computers will support attractive, graphical front ends and contain a modest amount of RAM for local validation of entered data.

A consumer market may eventually exist for inexpensive network computers to link households to the Internet, but it is their potential for use as enhanced terminals that will prove the largest market.

Traditional mainframe makers such as IBM, Digital, Hewlett-Packard, and Data General have joined with Oracle, Sun, and Netscape to develop standards that will insure compatibility between Java, network computers, and back-end servers.

IBM's System 390 group itself will offer support for Java in beta by the end of 1996 with full deployment by mid-1997. IBM plans to use Java to retrieve information from DB2 databases and to execute transactions over the Internet using server-side CICS. Pilot mainframe-based programs under way on the Web include L.L. Bean's voluminous catalog and a real-time reservation system for the Holiday Inn hotel chain.

Data General has also announced the first "thin server," designed to store and rapidly display retrieved data. DG's CEO, Ronald L. Skates, says that computing on the Internet and intranets requires not CPU-intensive processing horsepower, but better ways of viewing and accessing data.

The servers will start shipping in 1Q97. Advocates of fielding large centralized computers as Web servers contend that a mainframe's scalability, high performance, security, and reliability make them well suited to the task. Mainframes also offer superior data delivery throughput since they have native access to the back-end databases that store the vast reservoirs of data.

Built In, Not Added On

The tendency of major software and hardware vendors to support Java at the OS level promises to accelerate the acceptance of Java as a cross-platform development language. Increased Java support from third-party vendors will allow other applications besides browsers to download and execute Java applets locally. In the future, vendors of browsers that run on machines that support Java's operating system, called the Java Virtual Machine, will no longer need to Java-enable their browsers. Support will be built in at the system level.

IBM indicates that it intends to provide Java with its AIX, OS/2 Merlin, MVS, and AS/400 systems. Apple, Sun, and Novell will likewise integrate the Java Virtual Machine in their operating systems. IBM also plans to use Java to provide speech recognition in forthcoming versions of OS/2.

This strong support from third-party vendors helps ensure continued improvements to Java's performance and features. For example, JIT compilers will reportedly accelerate Java's performance up to 25 times by compiling its code instead of allowing it to run in its interpreted mode. In addition to faster execution, Java's compiled code will require a smaller footprint. JIT compilers are coming from Symantec, Borland, IBM and others. Microsoft plans to embed a JIT compiler into its forthcoming Internet Explorer browser.

Vendors will also provide fixes for Java's reported deficiencies, including increased telephony, network management, and bolstered security features. Suns says it plans to release new APIs and improvements to Java's AWT

Classes of Web Development Tools

Class	Characteristics	Users
Authoring for the Web	HTML authoring tools	Individual enthusiasts
	Multimedia content creation	Webmasters
	Static Web pages only	Multimedia professionals
	Nominal or no database interaction	Developer paraprofessionals
	No programming knowledge required	
Extensions to the Web	Extended legacy or client/server products; not intended for pure development	Professional legacy 3GL developers
	Screen-scrape to HTML extensions	
	Easy to implement	
	Interoperates with existing databases	
	Usually not object oriented; may be structured or object based	
	Platform dependent	
	Takes no advantage of Web and/or browser features	
Programming for Web	Operating system GUI programming metaphor	Professional visual programming developers
	Platform dependent for development	Professional RAD developers
	Takes little or no advantage of Web and/or browser features	
	Development either object-based or object-oriented; deployment may be component based	
	Can be used for either new development, or extended existing applications	
	Usually Java language, or scripting language for embedding into HTML	
Programming on the Web	Platform independent in terms of development and deployment	Professional developers specializing in platform independent Web applications
	Browser-based development metaphor	
	Primarily for new development, but because of object-oriented development and component-based deployment, optimal for reuse	

Source: International Data Corporation, 1996

(Abstract Windowing Toolkit, used to construct the application's user interface). Developers have complained that the AWT is awkward and incomplete, especially when compared to the tools available for Motif and Windows. Sun, by providing standard APIs and libraries, will accelerate the development process by providing collections of reusable and prebuilt parts.

Even Microsoft, as part of its overall Internet strategy, appears committed to releasing a Java-enabled version of Win 95-based Internet Explorer Web browser by 3Q96. In addition, Microsoft says it plans to improve the links between its ActiveX (network objects) technology and the Internet. Developers say that Microsoft's network objects technology is at a disadvantage when compared to Java's innate applicability for network use. Microsoft's OLE/OCXs are platform specific, difficult to program, and lack scalability. Java's network component architecture, Java Beans, provides improved security, scalability, and platform-independent reusable components. In addition, Java Beans allows all currently active Java applets to communicate with any others whether or not the server is running.

Sun, working with IBM and Apple, has announced bridges that allow Java Beans to communicate with OpenDoc, LiveConnect, and ActiveX components. Sun, which originally conceived of Java as a way to embed programs into home and business appliances five years ago, was in the right place with the right product during the Internet's Big Bang. Having the product, resources, and savvy to see an opportunity allowed Sun to focus its marketing efforts on positioning Java as a solution to provide Internet access.

Even though it has established a separate division, JavaSoft, to manage Java, Sun still retains significant control over the language. And although Sun has worked assiduously at providing an open architecture, it can still consider spinning JavaSoft off in an IPO and let it respond to market directions and pressures. Despite its first-generation limitations, Java is mature enough for that.

Conclusions

Developed more than five years ago, Java was designed as a language to create applets for embedded operating systems in home and business appliances. Java's ability to generate tight, portable code in memory spaces as small as 512K of ROM and 512K of RAM made it ideal for use in kiosks, vending machines, and set-top television boxes. When interest in the Internet soared, Sun responded quickly. It combined its Unix/TCP-IP expertise and marketing savvy to position Java as a solution to provide Internet access. Since then, almost every major software and hardware vendor has licensed Java and has attained and maintained a momentum of its own. Where Java's momentum will lead depends greatly on the vendor's ability to position it with users so that it addresses a valid value proposition.

Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

2Q96 IT Results: PC Demand Slows, but Overall Spending Stays Strong

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At this time last year, concerns pointing to a possible slowdown in technology market growth were circulating. Since that time, a few information technology segments have experienced limited turmoil that the overall market has avoided. The most pronounced disruptions occurred in the semiconductor and storage markets — the result of unforeseen blips in quarterly PC demand. Exacerbated by a move toward just-in-time manufacturing on the part of PC vendors, an ebb was created in short-term DRAM and HDD demand. That said, the long-term prospects of these two industries from 1995 to 2000 remain positive, with projected revenue growth of 13% and 20%, respectively. During the same period, PC unit growth will proceed at a healthy 15% clip.

Growth in all other IT segments continues to be excellent. Demand for software development and outsourcing services is propelling expansion in the services sector, and numerous forces such as Windows 95 and the Internet are driving prosperity in the software industry. The Internet and communications in general are particularly dynamic forces that are fueling the ongoing convergence of telecom, datacom, and internetworking. These areas continue to show exceptional progress. As the trend toward global connectivity accelerates, leaders in these markets will continue to benefit and drive industry growth.

This issue of *The Gray Sheet* looks closely at the trends driving spending in the multiple domains of IT. In keeping with *The Gray Sheet*'s commitment to tracking the emerging Internet market, a section is dedicated to discussing developments in the Internet arena. An Internet vendor portfolio provides a selection of U.S.-based companies whose businesses are primarily dependent on the future of the Internet. As these companies evolve from start-ups to stalwarts, they will be migrated from the Internet listing into a respective position in traditional segments in future spending issues. For example, Netscape and Check-Point will join the vendors in

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our systems software section, and companies like Yahoo and Excite will become part of a forthcoming section that will focus on content.

PERSONAL SYSTEMS

The PC market showed strong growth in the second quarter. However, vendors like Digital and Apple continued to struggle due to channel inventory problems. Despite this situation, Apple did manage to exceed street expectations as sequential performance stabilized at $2.2 billion. Apple's year-over-year revenue dropped, primarily due to falling unit sales. The preliminary estimate indicates that Apple shipped 837,000 units in the quarter, off from 1,002,000 a year ago. Unattractive products, a May recall of its Powerbook line of portables, and the terrible publicity surrounding the company's financial troubles led many buyers to take a wait-and-see attitude with regard to Apple's future.

Still, the latest news is mostly positive. Macintosh demand, which some news reports had indicated was in free-fall, appears to have steadied. The company has made progress on reducing costs and improving liquidity. Overall, we believe that these pluses, coupled with the continued loyalty of Macintosh customers, will give Apple's new management a chance to implement its strategy for returning the company to profitability and growth.

Nimble direct vendors, such as Dell and Gateway, were obviously unaffected by channel inventory levels and posted extremely strong gains. The benefits of agility became more pronounced with the recent fall in memory prices. Vendors with high inventory turns were able to take advantage of these drops. They were able to quickly lower prices and gain market share as a result of lower component costs and keep some extra margin in the process until larger competitors caught up. Aggressive inventory control on the part of larger vendors and more stable memory prices have eased the effect of this advantage.

The corporate buyers have showed their savvy in the portable market this quarter. Prior to this quarter, purchases were purposely put off until anticipated feature improvements such as faster processing speeds and larger screens were introduced. As a result, many portable vendors, including Texas Instruments and Sharp, experienced strong second-quarter growth.

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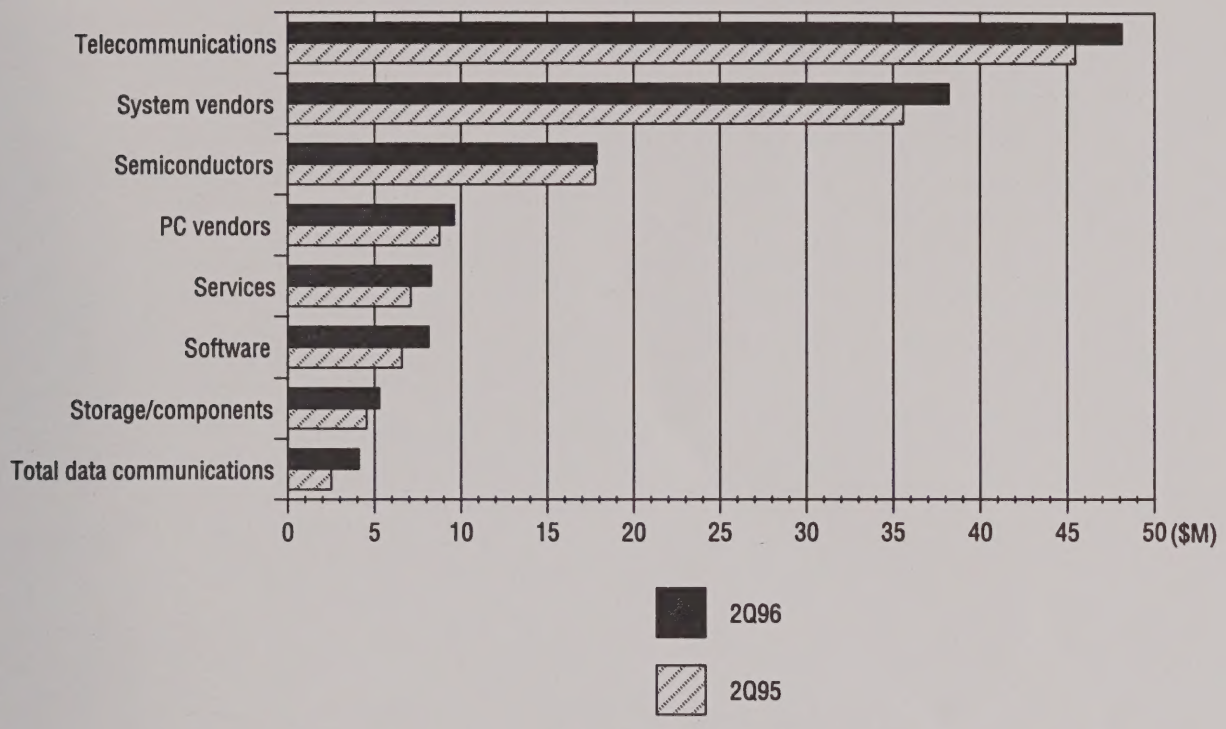
This spurt in demand, along with capacity constraints, has fueled backlogs in the portable market, specifically among top-tier vendors. Although the result may be lost sales, it allows them (to an extent) to avoid inventory problems and

Revenue Summary for 2Q96 and 2Q95: Leading IT Segments ($M)



2Q96 Total Revenues ($M) = $140,158.92
2Q95 Total Revenues ($M) = $128,575.76

Source: International Data Corporation, 1996

to keep margins up. However, the ongoing backlog in the U.S. market has allowed the entrance of new Asian competitors, most prominently Hitachi and Fujitsu. By fulfilling a certain amount of the backlog of top-tier vendors such as Toshiba, IBM, and Compaq, these two companies have quickly jumped into the ranks of the lower-tier vendors.

PC Servers

This segment continues to be characterized by price cuts and a technology migration to Pentium Pro processors, which started appearing in servers shipped in 2Q96. Initial acceptance of Pentium Pro is high, pressuring prices of existing Pentium products. Intel's push into the market with assembled motherboards (trading margins for market share) is also driving system price declines. Other factors forcing prices down include rapid declines in memory and storage prices, along with pressure from third-tier vendors trying to break into the market.

Such third-tier vendors, as well as PC vendors, are breaking into the market partly because of Intel's manufacturing of assembled SHV motherboards. No longer needing the expertise and R&D funds previously required, these vendors may now begin to compete with dominant players such as Compaq, IBM, Hewlett-Packard, and Dell. Most top vendors are leveraging price and are lowering margins in the face of this competition to maintain their market share. However, in spite of widespread price cuts, the average configuration values have remained relatively constant. Because most user budgets are fixed, lower prices simply result in the consumer getting more product at the same expense.

Microsoft's Windows NT operating system, which performs better with four-way boards than does Novell NetWare, is being used more frequently. However, NetWare, with its huge installed base of end users and certified resellers, still dominates. Increasingly, Internet software and networking hardware are being bundled with existing lines of servers to create new product lines marketed as Internet servers. Common packages include

Revenue and Net Income Summary for 2Q96 and 2Q95

	Revenue ($M)			Net Income ($M)		
	2Q96	2Q95	Change (%)	2Q96	2Q95	Change (%)
System vendors	38,205.20	35,591.45	7.34	1,419.96	2,748.82	-48.34
PC vendors	9,611.25	8,756.35	9.76	292.82	418.32	-30.00
Storage/components	5,284.32	4,550.67	16.12	194.04	259.34	-25.18
Total data communications	4,093.30	2,498.59	63.82	556.96	294.67	89.01
Telecommunications	48,129.21	45,468.38	5.85	5,326.22	2,411.47	120.87
Software	8,139.28	6,576.62	23.76	1,195.61	1,006.11	18.84
Application solutions	1,711.82	1,472.51	16.25	143.79	165.51	-13.13
Application tools	2,078.81	1,565.34	32.80	252.09	189.51	33.02
System software and utilities	4,348.65	3,538.78	22.89	799.74	651.09	22.83
Software with IBM software revenue	11,334.28	9,648.62	17.47	NA	NA	NA
Semiconductors	17,870.25	17,784.86	0.48	1,651.77	2,233.95	-26.06
Services	8,277.68	7,098.13	16.62	54.61	517.01	-89.44
Internet	548.43	250.71	118.75	-32.52	-20.99	54.91
Total without semiconductors	122,288.67	110,790.90	10.38	9,007.70	7,634.74	17.98
Total without IBM	121,975.92	111,044.76	9.84	9,312.47	8,152.69	14.23
Total without semiconductors or telecom	74,159.46	65,322.52	13.53	3,681.48	5,223.27	-29.52
Total without telecom	92,029.71	83,107.38	10.74	5,333.25	7,457.22	-28.48
Total	140,158.92	128,575.76	9.01	10,659.47	9,868.69	8.01

Source: International Data Corporation, 1996

Revenue from Selected U.S.-Based Computer Systems Vendors, 2Q96, 2Q95, and Year to Date

	Revenue ($M)			Revenue ($M)		
	2Q96	Q295	Change (%)	YTD 1996	YTD 1995	Change (%)
Computer Systems						
IBM	18,183.00	17,531.00	3.72	34,742.00	33,266.00	4.44
Hewlett-Packard	9,105.00	7,739.00	17.65	18,985.00	15,167.00	25.17
Digital	3,719.25	3,749.87	-0.82	7,340.28	7,217.33	1.70
Sun Microsystems	2,018.06	1,648.07	22.45	3,858.09	3,153.10	22.36
Unisys	1,505.00	1,519.80	-0.97	2,928.10	2,984.70	-1.90
Silicon Graphics	825.94	653.21	26.44	1,502.88	1,230.19	22.17
EMC	545.02	478.55	13.89	1,066.50	926.67	15.09
StorageTek	479.31	480.70	-0.29	932.79	930.89	0.20
Tandem	465.78	499.15	-6.69	1,041.98	1,015.09	2.65
Amdahl	382.85	378.67	1.11	699.88	750.19	-6.71
Data General	323.20	280.50	15.22	658.40	564.30	16.68
Sequent	142.59	139.21	2.43	263.33	255.31	3.14
Stratus	140.30	140.32	-0.01	283.23	268.82	5.36
Intergraph	268.17	260.17	3.07	524.87	517.50	1.43
Auspex	47.77	35.28	35.39	91.10	65.31	39.49
Sequoia	23.15	26.85	-13.81	46.80	57.50	-18.61
NetFRAME	18.81	19.91	-5.52	38.88	33.06	17.61
Tricord	12.01	11.20	7.22	30.46	27.37	11.29
Total	38,205.20	35,591.45	7.34	75,034.56	68,430.32	9.65

Source: International Data Corporation, 1996

Microsoft's Information Internet Server software or Netscape Commerce Server software, along with various authoring tools. Price competition will continue into 1997. The use of Windows NT, fully assembled motherboards, and Pentium Pro will increase, changing the competitive landscape and thus keeping pressure on prices and margins for the foreseeable future.

MIDRANGE SERVERS

Intel processors continue to gain ground and replace RISC in the midrange market, as evidenced by RISC vendors such as Data General and HP adopting the NT/Intel model. Not only is this less costly, because funds are saved on proprietary developments, but it also has resulted in continued price/performance improvements. All vendors seem to be moving toward NT for future product lines, but Unix is still used for mission-critical applications such as large databases, for which performance is essential.

Sun is bucking the trend toward NT/Intel with its own strong processor and proprietary operating system. Sun, with a long-established client list, is betting on Java and the "thin client/powerful server" model to drive future growth here. Sun has also introduced its UltraEnterpise line of servers. This line looks promising, based on its new fast bus 2.6GBps backplane and the fact that all components are "pluggable," meaning investments are preserved with subsequent upgrades.

NCR is developing and pushing its own new technology, called NUMA, to allow the move from four-way to eight-way boards because NT is not yet up to the task of running eight-way boards. NUMA will also allow the user scalability by stringing systems together in the same box. Sequent and

Data General are also due to come out with new NUMA products at the end of the year. In fact, Data General has been endorsed by Santa Cruz Operation (SCO) and licensed by International Computers Ltd. (ICL) for its NUMA product.

Digital's new 4100 Rawhide offering (in the Alpha line) fills the gap it left in the midrange. This 64-bit system is ideal for data warehousing. With very large memory (VLM), this system reduces the need to go to disk for queries, dramatically increasing speed. The 2100 model on the low end is a fast NT server and an adequate Web server. However, new sales here are not fully replacing lost revenue from VAX systems. Sales of Digital systems running OpenVMS have increased, largely because of the operating system's affinity with NT. The similarities between these operating systems makes it easy for users to manage both, using OpenVMS for critical applications and NT for less critical pieces.

IBM is falling behind in the Unix market due to problems with shipping its PowerPC 620, but its SP2 has done well on the high end. The RS/6000 sells well to IBM accounts, but not elsewhere. IBM's AS/400 64-bit RISC system offers competitive price/performance and is well suited for data-warehousing program development. It is essentially a plug-and-play system and has done well overseas, where programming talent is harder to come by. Tandem's growth has come to a halt in the fault-tolerant high end. The vendor is now looking toward NT to fuel future growth, having recently announced its support of a Microsoft clustering technology called Wolfpak.

The move toward clustering is gaining momentum, and Oracle's shared disk technology remains the great enabler. Nonetheless, clustering is not achieving its potential in regard to performance, because the operating systems used cannot yet distribute work efficiently. There is still room for improvement in this area.

Data warehousing, data mining, and online transaction processing (OLTP) continue to drive sales and upgrades as users find ways to get more value out of these activities.

Data warehousing, data mining, and online transaction processing (OLTP) continue to drive sales and upgrades as users find ways to get more value out of these activities. NCR is showing continued strength in data warehousing, with significant sales of NT servers for this purpose.

LARGE SERVERS

The mainframe market has seen some growth in revenue as technology continues to migrate from ECL to CMOS. Vendors that are slow to adapt to this change (such as Amdahl and Hitachi) do so at the risk of market share. Vendors that move quickly to ramp CMOS systems (such as IBM) will likely be rewarded for their aggressiveness. Hitachi does not expect to begin shipping its CMOS systems until early 1997, in time for fourth-quarter buying in Japan. Hitachi has historically missed out on fourth-quarter U.S. purchasing in favor of launching new products just in time for the fourth quarter in Japan. On the upside, its ECL-based Skyline systems continue to remain successful on the very high end of the market. Amdahl expects to begin shipping its Millennium line of CMOS systems in the third quarter of this year.

For IBM, revenue has not yet flourished. Customers appear to be delaying their purchases until the company's new line arrives in September. In the meantime, IBM is quietly confident that fourth-quarter CMOS revenue could be record breaking. The cost per seat for systems like IBM's will be less than that of traditional mainframes in large environments. Another good sign is that systems with IBM's S/390 continue to maintain a 15% to 20% price/performance premium over Unix systems.

Unisys has announced availability of CMOS on its A Series and 2200 Series and, to this point, has shipped a significant share of large-scale CMOS systems. Unisys still maintains strength in vertical markets such as the airline industry (baggage handling), banking (OLTP), and telecommunications (telephony applications).

CMOS systems are now good enough to compete with ECL on performance due to their use of clustering. This has been exemplified by IBM's use of hardware-assisted clustering in its parallel Sysplex systems.

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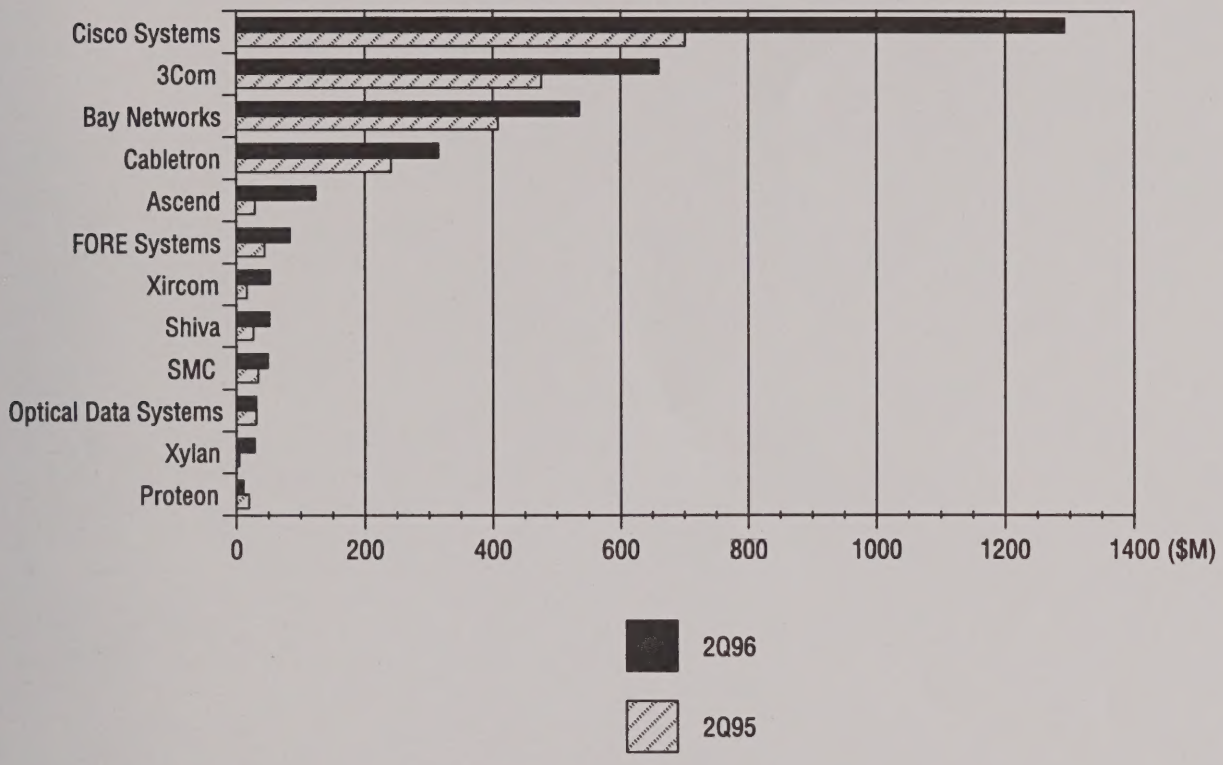
Revenue from Selected U.S.-Based LAN Communications Vendors, 2Q96 and 2Q95 ($M)



2Q96 Total Revenues ($M) = $3,232.07

2Q95 Total Revenues ($M) = $2,030.23

Source: International Data Corporation, 1996

hardware-assisted clustering in its parallel Sysplex systems. Amdahl was the first to develop an S/390 "clustered" utilizing its CMOS-based Millennium series systems. Amdahl, Hitachi, and IBM will probably continue offering "smart clustered" solutions, including packaged disks, software, and applications.

Overall, the introduction of CMOS systems, at a fraction of what ECL systems cost to manufacture, have allowed better price/performance ratios in the large-system market. Margins for vendors are higher with CMOS than with ECL systems, even though much of the savings are passed to consumers. The use of CMOS has led to faster product cycles, mirroring what has already occurred in the PC market. The move to CMOS and clustering will continue to drive the large-system market. Price drops in this market are estimated to reach approximately 35% per year. As scalability improves, the lines between mainframes and the midrange machines will blur. Furthermore, traditional mainframe vendors will become more competitive with midrange vendors in an attempt to win back what was once their domain.

SEMICONDUCTORS

Semiconductor revenue continued to slide in the second quarter of 1996, down 12.5% sequentially and 11.7% from 2Q95. Total first-half revenue was up slightly (1.3%) compared to the first half of 1995. The major culprit in the revenue decline continues to be the DRAM market. DRAM revenue declined by 40.4% compared to first-quarter 1996. First-half 1996 DRAM revenue declined 8.4% compared to first-half 1995. The decline in the DRAM market in the second quarter was the result of oversupply. This excess product was used to drive down the price of DRAMs to discourage further investment in the market by new DRAM vendors, specifically Taiwanese manufacturers. Outlook for the third quarter is for stabilized DRAM prices, because most vendors

are in the process of cutting back on production.

Not all market segments are experiencing the ASP pressure of the MOS memory market. The microperipheral (MPR) segment, which includes the graphics chips supplied by S3, grew by 5.2% over first-quarter 1996. S3 announced that its revenue was up 74.0% in the second quarter of 1996 compared to second-quarter 1995. Net revenue for the first six months of 1996 increased 67.0% compared to the first six months of 1995.

Intel announced a new record: net income exceeded $1 billion for the first time.

Intel announced a new record: net income exceeded $1 billion for the first time. The second quarter also set new records for unit shipments of MPUs and chipsets. Intel saw these records as validation that the high-performance PC market is still healthy. The MPU segment in the second quarter had a slight decline of 3.8% over first-quarter 1996.

Motorola participated in the Olympics in Atlanta — it supplied the microcontrollers used in the Olympic VISA smart cards. The microcontroller (MCU) segment showed a second-quarter revenue increase of 6.1% over first-quarter 1996. Motorola increased revenue in the first half of 1996 over the first half of 1995 by 7.0%. Motorola sales were down in the second quarter over the first quarter by a mere 0.7%. Motorola has limited participation in the DRAM market, but DRAM was a contributing factor to the sales decline. Additionally, competition is driving down cellular phone prices and thus revenue. Overall, the semiconductor product segment was down 5.0% over the second quarter of 1995.

STORAGE

For many reasons, 1996 is proving to be a challenging year for HDD suppliers, notwithstanding our outlook for double-digit year-to-year revenue growth. As a derived-demand business, HDD suppliers are feeling the effects of more conservative inventory management and varied sales momentum among top-tier PC suppliers. Among the first to disclose such pressure was Quantum, which, early in June, communicated a shortfall in near-term demand. After a solid 1QCY, the company saw sequential volumes and revenue slip 8% and 6%, respectively. Certainly the company's own desktop product transition issues contributed to the shortfall and exacerbated what proved to be relatively flat overall demand patterns.

Seagate, too, has been affected by industry conditions, compounding the company's ongoing merger-related issues. June marked the second consecutive quarter of declining unit shipments. Sustaining desktop momentum subsequent to the Conner integration has been difficult; in our view, product delays and customer disruption are taking their toll.

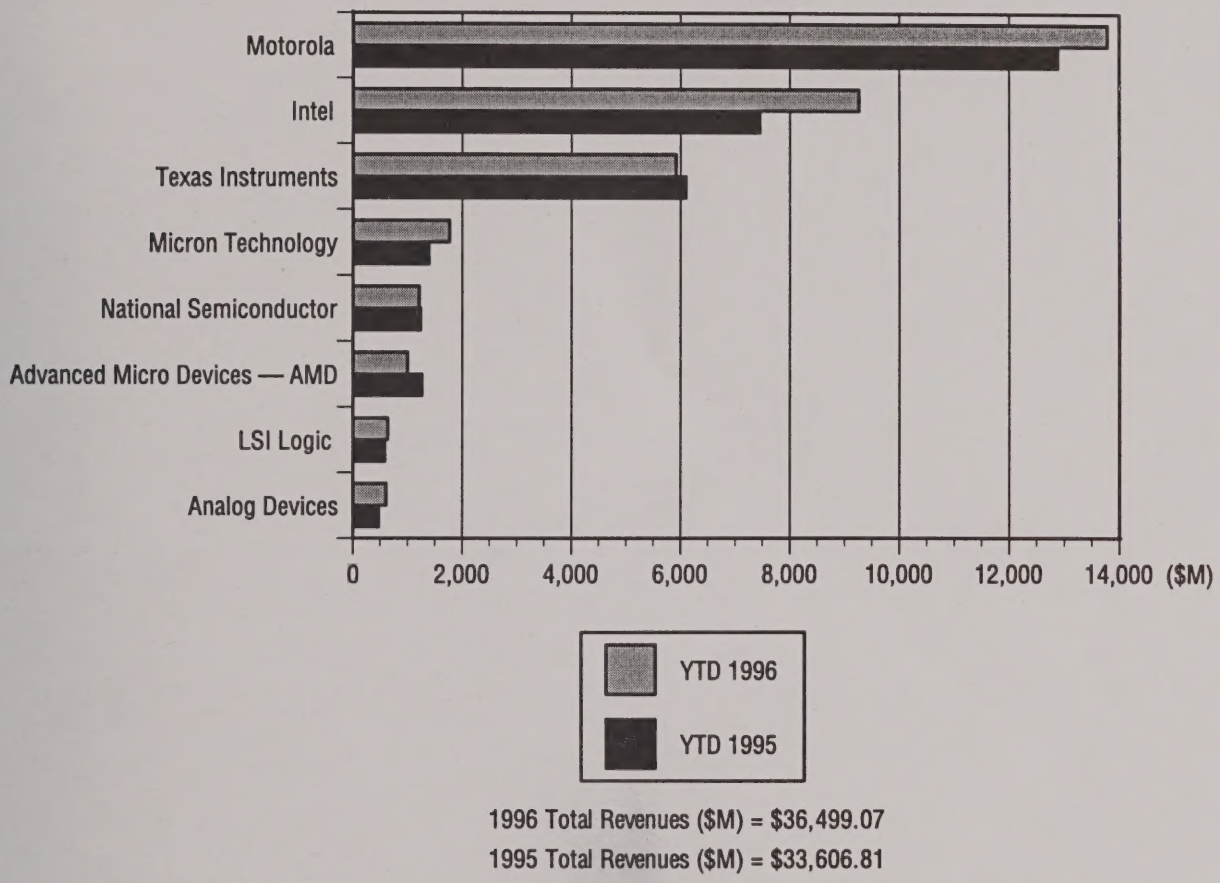
Of the public suppliers, only Western Digital meaningfully "bucked the trend" in the June quarter, posting sequential-quarter growth in both units and revenue. We attribute this momentum to a combination of (1) excellent execution with Caviar desktop HDDs and (2) an opportunity. As competitors shift business models, a void has been left, and Western Digital has effectively leveraged it. On a positive note as well, virtually all suppliers have experienced only modest increases in inventory and standard price declines.

The recent environment has impacted business and put pressure on margins for component suppliers as well. In general, suppliers such as Komag and Read-Rite are finding reduced pricing leverage and rescheduled orders. Over the balance of the year we expect component companies to be required to step up to a broader product scope that encompasses multiple technologies. Delivering on this potential will be important to growing a successful business in the context of increased vertical integration on the part of HDD suppliers.

SOFTWARE

For the second quarter of 1996, International Data Corporation's database of U.S.-based ISVs shows a 31% increase in revenue over 1995's second quarter. The application tools and system software and utility segments were the mainstays of the market, with growth rates of 32% and 34%, respectively. Application solutions trailed closely behind, with a 22% increase from last year's second quarter. Throughout the period, consolidation trends continued; other vendors extended their product lines to fill voids and come up with alternative solutions for customers. Powerful trends — the growth of Windows NT, client/server applications, data warehousing, the Internet/intranets, and the year 2000 crisis — are all central to

Revenue Summary for 2Q96 and 2Q95: Leading Semiconductor Firms ($M)



1996 Total Revenues ($M) = $36,499.07

1995 Total Revenues ($M) = $33,606.81

Source: International Data Corporation, 1996

driving the software market for the short and long term.

In the PC OS segment, Microsoft had another stellar quarter. Windows 95 shipments, at 10.3 million, were up 2% versus Q1, as penetration on new Intel PC shipments rose slightly, to just under 60%. Windows 95 revenue was about $495 million for the quarter, with Microsoft continuing its practice of deferring some 20% to 35% of that figure across the projected two-year life cycle of the product to account for assumed service costs.

Of course, all the buzz was about Windows NT. Version 4.0, which sports the Windows 95 user interface, shipped to manufacturing ahead of schedule this month. NT Workstation (client) shipments for the second quarter were about 500,000, continuing the strong ramp up from the first quarter's 375,000. A surprising 120,000 were preloaded, meaning that OEMs are bundling NT Workstation (NTW) on more than just Pentium Pro machines. NT as a client contributed about $78 million in revenue in the second quarter. NT server licenses were up 7% sequentially (60% year-over-year), to about 135,000 for the quarter, accounting for $130 million in revenue.

On balance, we believe that certain analysts' expectations for NT are way out of line. We are standing by our forecasts of just over 3 million NTW units for calendar 1996. This forecast is based on a survey-driven assumption that by 4Q, 30% of PCs shipping to large companies will run NT. Adoption in small and medium-sized companies will be far less and very low indeed in homes and on portables. Anyone looking for NT to outship Windows 95

into all businesses in the near term will be sorely disappointed.

Still, the popularity of NT as a server base is evident. A steady stream of announcements about plans and availability for applications surfaced this year. HBO & Company, the largest vendor in terms of health-care application revenue, announced an NT-based application for smaller hospitals. There also seems to be an increase in the business of NT servers as the server of choice for the large enterprise application vendors like SAP and PeopleSoft.

Also driving the software market was the inclusion of complementary products into the existing product lines of some of the large suite providers. Oracle, for one, tightly integrated a new sales/marketing system and a sales configuration with its existing accounting, human resources, distribution, and manufacturing product suites.

The second quarter also showed an accelerating number of partnership announcements between enterprise application vendors and others specializing in multidimensional databases, such as Arbor Software, or decision support tools, such as Cognos and Business Objects. The package offerings specifically represent data from enterprise applications in a form amenable to analysis. Consequently, Business Objects and Cognos are seeing more and more of their businesses linked up to the enterprise application. According to Business Objects, 30% of its new contracts are solutions to specifically access package applications. This will increase among the largest vendors and similar partnerships from smaller vendors in the next few quarters.

For the major application tool vendors — Oracle, Informix, and Sybase — the swelling data-warehousing market is still offering major opportunities. The vendors continue to invest heavily in this market: Oracle reported 44% growth over last year's second quarter, and Informix reported 38% growth from 2Q95. Sybase, on the other hand, showed a loss of $24.6 million as it faced a number of marketing issues — scalability, raw performance, integration, and quality. Despite the optimistic outlook on data warehousing, challenges remain, some on the horizon and some now.

Several persistent problems threaten to slow the rate at which businesses are adopting data warehouses. These problems include technological issues such as dynamic schema management, metadata-driven processing, support for temporal data, hardware and software scalability, more sophisticated exploratory data analysis, and automated operations. But to the extent that problems represent opportunities, vendors sense the vast potential that exists in this market as users begin to search out formal ways to leverage their information assets.

Trends are also emerging that show vendors developing the next wave of databases to allow for storage, search, and retrieval of new data types — for example, three-dimensional graphics, video, audio, HyperText Markup Language (HTML), spatial data, time series data, and documents.

Major vendors have announced strategies to support these unconventional data types. One is Informix, which offers an object relational database with snap-in software modules called DataBlades. This technology offers a set of multimedia database capabilities, which enable structured query language (SQL) querying of complex data types, and is optimized for Web connectivity. Other vendors are also working on DataBlades; more than 100 products are currently under development.

The emergence of new companies to exploit these and other opportunities resulted in expansion in the market; however, significant consolidation trends also pervaded into the second quarter.

In a move to synergize application software with its full-service business, information technology services giant Computer Sciences Corporation (CSC) announced in April that it plans to acquire the Continuum Company, a software and services enterprise that focuses on insurance and banking applications, in a stock swap valued at approximately $1.44 billion. Just a few weeks before, Continuum had completed its acquisition of Hogan, a banking application company. The marriage drove CSC into the upper echelon of competition within the financial services industry segment. It also reflected a trend toward the blurring of distinctions among major sectors of the industry.

The merger between Pure Software and Atria Software in June made a significant mark on the software-testing arena. This merger of equal-sized companies holds the promise

Revenue from Selected U.S.-Based Telecommunications Vendors, 2Q96, 2Q95, and Year to Date

	Revenue ($M)			Revenue ($M)		
	2Q96	Q295	Change (%)	YTD 1996	YTD 1995	Change (%)
Telecommunications						
AT&T	13,032.00	12,761.00	2.12	25,988.00	25,142.00	3.36
GTE	5,293.00	4,932.00	7.32	10,244.00	9,597.00	6.74
BellSouth	4,620.00	4,390.00	5.24	9,161.00	8,689.00	5.43
Ameritech	3,744.00	3,369.00	11.13	7,311.40	6,514.70	12.23
Sprint	3,506.40	3,142.10	11.59	6,878.30	6,221.20	10.56
Nynex	3,445.80	3,267.70	5.45	6,768.80	6,415.80	5.50
SBC Communications	3,332.70	3,025.00	10.17	6,529.40	5,934.90	10.02
Bell Atlantic	3,259.50	3,564.50	-8.56	6,467.10	7,014.20	-7.80
US West	3,124.00	2,894.00	7.95	6,174.00	5,722.00	7.90
Pacific Telesis	2,393.00	2,231.00	7.26	4,727.00	4,485.00	5.40
WorldCom	1,061.40	894.72	18.63	2,087.59	1,759.75	18.63
Frontier	670.28	506.92	32.23	1,325.43	965.96	37.21
AirTouch Communications	481.30	403.40	19.31	930.20	777.30	19.67
Mtel	88.21	56.86	55.13	168.80	107.49	57.03
Nextel	77.62	30.18	157.21	145.94	59.68	144.54
Total	48,129.21	45,468.38	5.85	94,906.95	89,405.98	6.15

Source: International Data Corporation, 1996

of integrated tools covering both design management and testing, which is key to a true software quality process.

This move could alter the competitive landscape for software configuration management and automated software quality tools. Initially, software development organizations will be afforded one-stop shopping for software configuration management and automated software quality. In the longer term — assuming Pure Atria successfully achieves true product integration — users will reap the benefits of managing software testing as an integral part of the development life cycle, which will result in a measurable improvement in the quality of delivered software applications.

DATA COMMUNICATIONS

Riding the wave of demand for information transfer technology, data communications vendors posted their sixth consecutive quarter of accelerated growth. Revenue for IDC's selection of U.S.-based vendors increased more than 60% over the same period a year ago. Market leaders Cisco Systems and U.S. Robotics contributed most to the industry's stellar second-quarter results. Cisco's sales increased 82% over last year's period to $1.29 billion, while USR ramped quarterly revenue from $237.4 million to $546.8 million. At 130.4%, USR's first-quarter growth rate was topped only by that of smaller, focused players like Xylan (+526.7%), Ascend (+331.6%), and Cascade (+176.3%).

The successes of Cisco and USR can be attributed to the skyrocketing demand for bandwidth on the Internet. As Internet service providers grow their networks to increase serviceability, both companies will continue to be sought as strategic partners.

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skyrocketing demand for bandwidth on the Internet. As Internet service providers grow their networks to increase serviceability, both companies will continue to be sought as strategic partners. The success experienced by these two giants also emphasizes the benefits of market leadership and product diversity. On the access side, U.S. Robotics has been unmatched. Retail channel strength underscores its success in the commoditized modem arena. Meanwhile, its Total Control offerings have momentum into the ISPs, contributing greatly to revenue and revenue growth. Similarly, we expect to see continued strength with USR's broadening line of ISP-targeted products.

However, the "Big Four" (Cisco, 3Com, Bay Networks, and Cabletron) continue to make headway in the access arena. All four have recently augmented their offerings in the fast-growing remote-access server (RAS) concentrator segment, either internally or through acquisition. As a result, the borders that separate access from internetworking are beginning to blur. This dynamic is a major threat to access vendors, which have no apparent means of either defending themselves or going on the offense (i.e., by entering the internetworking space). Larger companies (like USR) and best-of-breed players (like Ascend) should continue to do well, but we believe that modem vendors that do not fully transition into legitimate access companies will struggle, despite exceptional market growth.

On the internetworking side, Cisco posted increases in all market segments and cashed in on its investments in hot areas like remote access and switching. Yet, despite the tremendous ramp-up of its Catalyst 5000 switch, router sales have yet to show signs of succumbing to the cannibalistic threat that switching poses. Instead, Cisco has been successful in selling a combination of switches and routers into its growing base of customers. Thus, asynchronous transfer mode (ATM) is the one area in which it hasn't hit the mark.

Cisco has a long history of successful acquisitions that have driven its domination of the internetworking arena. However, Lightstream and Kalpana have been the exception, and Lightstream's new 1010 switch does not promise to be its savior in this segment. Nonetheless, leadership on the backbone, combined with its Stratacom and Telebit acquisitions, give Cisco more than enough leverage as demand for Internet infrastructure equipment continues to grow at a staggering rate.

FORE Systems has also turned to LAN switching, not as a step up from routers but as a step down from its focus on ATM. Despite triple-digit growth, it has become quite clear that the proliferation of ATM will be a longer, more drawn-out process.

FORE Systems has also turned to LAN switching, not as a step up from routers but as a step down from its focus on ATM. Despite triple-digit growth, it has become quite clear that the proliferation of ATM will be a longer, more drawn-out process. As a result, its acquisition of Alantec made sense, providing FORE with best-of-breed LAN switching technology and strong ethernet presence. It will become an increasingly important hedge, as ATM meets the challenge of gigabit ethernet. On the wide area side, Newbridge Networks, with plenty of local carrier mind share, has been extremely successful in following its frame relay successes with a strong move into ATM. Newbridge garners the lion's share of this market on the WAN and is leveraging its massive installed base for repeat sales. Stratacom, now under Cisco's wing, is looking to find its stride in the private networking sector. It is positioning ATM as a replacement for time-division multiplexing (TDM).

ATM is also boosting the top and bottom lines for General Datacom (GDC). Revenue reached a six-quarter high, and the company's net loss was the lowest since December 1994. However, most of GDC's revenue still comes from older, low-margin access commodities, and ATM research spending has been on the low end of the industry scale. As a result, GDC is repositioning its sales force to focus on selling its ATM and other high-growth products while relying on resellers to move its older line of products.

TELECOMMUNICATIONS

In the second quarter of 1996, the telecommunications market experienced a 3.6% increase over the first quarter of 1995, and net income increased by 12.9% in the same time period. Although this growth is not extraordinary, the quarter was characterized by mergers,

Revenue from Selected U.S.-Based Internet Vendors, 2Q96, 2Q95, and Year to Date

	Revenue ($M)			Revenue ($M)		
	2Q96	Q295	Change (%)	YTD 1996	YTD 1995	Change (%)
Internet						
AOL	334.47	151.89	120.20	646.81	261.00	147.82
Netscape	75.01	14.07	433.02	131.13	20.52	539.11
UUnet Technologies	57.02	20.01	185.02	100.03	35.03	185.60
Netcom On-Line Comm.	28.02	10.53	166.18	52.12	18.03	189.18
Quarterdeck	16.02	28.09	-42.96	62.74	58.65	6.97
Spectrum Holobyte	13.07	16.97	-22.97	28.60	30.12	-5.03
Verity	10.02	4.22	137.34	18.02	8.52	111.42
Spyglass	6.00	3.15	90.33	10.64	5.60	89.91
Yahoo	3.27	NA	NA	5.01	NA	NA
Raptor	2.91	0.73	300.97	4.98	1.14	335.26
Metricom	2.60	1.05	147.76	4.26	2.70	57.43
Cybercash	0.02	NA	NA	0.04	NA	NA
Total	548.43	250.71	118.75	1,064.36	441.30	141.19

Source: International Data Corporation, 1996

acquisitions, and other activities that reflected the deregulatory environment, which resulted from passage of the Telecommunications Act in February. Second-quarter results were also driven in significant part by the carriers' adoption of Internet strategies.

The Telecommunications Act, which encouraged open and fair competition in all telecommunications markets, created a new telecommunications playing field. Interexchange carriers (IXCs) are now faced with a new reality in which regional Bell companies (RBOCs), independent local exchange carriers, competitive access providers, and even cable companies can compete in the long-distance arena. However, it is evident that because of RBOC requirements that IXCs meet a "14-point checklist" before entering in-region long distance, the IXCs have roughly a one- to two-year grace period before competition becomes keen. RBOCs will be able to provide an in-region long-distance service prechecklist with regard to audio/video programming, Internet for schools, mobile services, information/alarm services, or telecommunications signaling.

The enactment of the 1996 telecommunications legislation also had a positive impact on WorldCom, an IXC. So far this year it has signed agreements to resell wholesale long-distance capacity to GTE Corporation, Ameritech Communications, and Southwestern Bell Mobile Systems. The company has also been expanding its role in the consumer debit card market and has signed a multimillion-dollar agreement with sports star Michael Jordan to help promote WorldCom's services as its spokesman.

WorldCom has joined with Avis Rent-A-Car to launch an imaginative new long-distance debit card program. Avis is distributing to its rental car customers 3 million WorldCom debit cards, each with 10 minutes of prepaid long-distance calling time. The company has signed an exclusive agreement as well with Delta Airlines for a passenger calling card program.

In addition, WorldCom has received permission to provide competitive local services in Connecticut, Illinois, California, and Texas. LDDS WorldCom plans to bundle resold local exchange services with its interexchange services.

Another tangible result of the passage last quarter of the

Telecommunications Act was the merger of Bell Atlantic and NYNEX, which produced the second-largest telecommunications company behind AT&T. From an international long-distance perspective, the merged entity's combined geography enables the company to amass significant traffic volumes for European destinations. The huge volume of traffic allows Bell Atlantic to lower its prices for international calls and thereby capture both business and residential market share. In addition, the increased volume creates a significant competitor in the highly volatile U.K. local telephone market.

A highpoint of the second quarter was the merger of MFS Communications Company and UUNET Technologies. This merger marked the first purchase of an Internet service provider by a telecommunications company.

A highpoint of the second quarter was the merger of MFS Communications Company and UUNET Technologies. This merger marked the first purchase of an Internet service provider by a telecommunications company. As a result of the $2 billion deal, the combined company will now be able to provide voice, data, Internet, and video services. Some of the benefits of this synergy will be lower network expenses for local communications services, increased purchasing power, and improved operating margins from Internet services. The success of this merger also hinges on the continued focus on the business customer. Further activity of this type is expected in the future as ISPs develop better value-added services and customer service capabilities.

Telecommunications providers are aligning themselves for impending competition; however, they are also looking to companies in other markets to round out their service portfolios. Earlier this year, Ameritech and IBM announced a relationship to target desktop outsourcing opportunities, an area in which Ameritech had little experience. Thus, by offering a full range of services, the regional providers feel that they will be better prepared for the imminent competition.

Until the dust settles from consolidation, it is unlikely that the net income of the telecommunications market will rise drastically. Nevertheless, with these mergers, acquisitions, and the advent of the Internet driving the market, the expansion of the telecommunications industry will remain consistent. The growth of data services will offset any potential loss of revenue in the voice market. As companies roll out new services and create new entities, it is unlikely that the industry will begin to outpace its present status in revenue.

Finally, increasing competition as a result of the 1996 Telecommunications Act will also contribute to the lower revenue driven by the market. Increased competition will likely mean lower-cost services, at least until companies carve out new niches for themselves in this dynamic industry.

SERVICES

Overall, public companies in the services business continue to grow at an impressive rate. Application development, systems integration, and data center outsourcing companies are expanding aggressively, and application outsourcing, processing services, and operational services are growing quickly. The portfolio of selected service companies at IDC grew 16.6% over the second quarter of last year.

The key issues to consider in a discussion of future growth rates with these service companies are (1) the ability to attract resources and (2) the ability to develop leveraged services. Many companies, particularly in the consulting and integration space, claim that business growth is defined primarily by constraints on resources. The challenge of recruiting, retaining, and leveraging resources will be a key attribute for growth in the future.

Companies focused on software development, such as AMS and Cambridge Technology Partners (CTP), continue to achieve extremely high growth rates. AMS traditionally grew at steady if unspectacular rates throughout its history. However, in the past year, its strategy toward focused expertise and intelligent use of software has paid impressive dividends. Cambridge Technology Partners continues its rapid growth as it tackles larger, more complex projects in areas such as customer management systems.

Various flavors of outsourcing also continue to grow at rates between 17% and 22%. For companies like EDS and CSC, prospects for the future continue to be attractive, although the size of these companies will make growth rates of 20% and above difficult to achieve.

EDS and CSC will probably reassess their business models over the next year or two to reposition their service offerings. The business process outsourcing and new opportunities to operate service bureaus may grow in priority.

Keane's growth rate in particular should be sustainable as attractive programs like the year-2000 services roll out. Keane has a very powerful offering in this area; its margins should remain strong and its growth over the next several years limited only by its capacity to hire resources.

Industry growth continues to be very strong, with most vendors reporting percentages in the mid- to upper teens. Only Banctec, Computer Task Group, and Wang are growing at single-digit rates due to specific challenges facing each firm. Banctec's marketplace will probably improve over the next year. Both Computer Task Group and Wang are facing organizational changes and repositioning in the industry. For these vendors, growth is not expected to turn around dramatically this year.

AMS and Cambridge Technology Partners are maintaining their margins although they are in considerably different situations. Both companies have effectively managed labor issues and the linkage with reuse and leverage in order to expand productivity.

AMS and Cambridge Technology Partners are maintaining their margins although they are in considerably different situations. Both companies have effectively managed labor issues and the linkage with reuse and leverage in order to expand productivity. Specific solutions and selection of service offerings have been critical problems for these companies, and profit margins in the outsourcing market have been a concern.

Despite the benefits of leverage, the markets are not as fragmented as they were and therefore more competitive. EDS and CSC continue to hold historical margins, mainly through the benefits of their consulting businesses. Again, new business initiatives are the key areas regarding these organizations. In contrast to AMS and CTP, ADP and Keane are facing margin pressure. Future direction in this market will depend on peripheral services like consulting and systems integration, as well as specialization in certain markets, as is the case with Keane.

Solid growth in the services marketplace is projected over the next five years, and the outlook for these companies continues to be excellent. The acceleration of mergers and acquisitions plays to the strengths of the companies that have the size and financial resources to position their services through acquisition and to emphasize their position through marketing programs.

INTERNET APPLICATIONS AND ISSUES

The breadth of potential applications for the Internet has spurred rapid segmentation. Hundreds of companies, from startups to well-established public companies, are stampeding to this new Promised Land. Some of the battle lines, however, have already been drawn. The largest prize to be won is ownership of the enterprise. Essentially, the players in this race have been whittled down to two: Microsoft and Netscape (see "Netscape Takes On the Microsoft Empire," *The Gray Sheet*, Volume 31, Nos. 11 & 12). Undisputedly, Microsoft rules the desktop. Over the past 10 years, it has leveraged the PC revolution to grow sales at a 46% clip, from less than $200 million in fiscal 1986 to $8.7 billion in fiscal 1996 (ended in June). Its most potent weapons were (and continue to be) its marketing abilities and Windows products.

However, a dynamic shift from user-centric to network-centric computing has created an opening through which the playing field might be altered. This potentially new playing field is the browser, a software interface between a user and the World Wide Web, the graphical (and fastest growing) portion of the Internet. Netscape recognized this opportunity and initiated a strategy of giving its browser, Netscape Navigator, away for free on the Internet. It quickly became the market share leader and currently dominates the worldwide installed base of browsers. This leadership has translated into exceptional licensing revenue for Netscape's browsers and server software (second-quarter sales reached $75 million, five times the year-ago level and up 36% sequentially).

Microsoft is countering Netscape's tactics by licensing its browser, Internet Explorer, for free. In addition, the software giant plans to leverage its desktop might by bundling

its browser with Windows 95. The fast-expanding number of Internet-suited applications will create demand for server software (as well as hardware) to specifically address each individual application. Thus, several new subsegments will emerge, decreasing the likelihood that a single vendor will "own" the Internet. We also believe that distribution, partnerships, and mind share will be paramount to success in any of these areas.

Internet search companies, like Yahoo and Excite, follow a business model akin to that used by the radio industry. Attracting a larger "audience" also attracts higher revenue from the sale of advertising space and demographic information.

The same holds true for other major Internet segments, including the firewall and search markets. Internet search companies, like Yahoo and Excite, follow a business model akin to that used by the radio industry. Attracting a larger "audience" also attracts higher revenue from the sale of advertising space and demographic information. Because these companies can track usage as well as the specifics of each individual search, vendors are willing to pay top dollar for information on user interests, which is then used to execute targeted marketing campaigns at Web search sites.

As users become more sophisticated, perceived utility, ease of use, and ease of access will translate into Web "hits," which will ultimately determine the winners in this dynamic segment. The exception to this rule is Digital Equipment Corporation. The company wants to spare users from commercialism by selling its engine to users, eliminating its dependence on advertising revenue in the process.

The most important watch factor in the search arena involves the possibility of Microsoft and Netscape incorporating search capabilities into their browsers. If this occurs, it is likely that they will choose to partner with a search company, as opposed to licensing technology from a search engine vendor such as Open Text. The goal would be to acquire a complete search solution, not to create a new solution from scratch.

Ultimately, a qualified search partner will exhibit strong search response quality and scalability. In the firewall segment, the marketing approach is significantly different. These vendors are leveraging security fears to spur sales growth and gain market share. As the rapid deployment of Internet and intranet servers reaches critical mass, firewall sales are expected to follow suit, topping 1.5 million units by the year 2000. CheckPoint Software dominates this segment with a 40% share, more than 30 points ahead of second-position Border Network Technologies.

CheckPoint's strength lies in its distribution agreements with value-added resellers and top server vendors Sun and Hewlett-Packard. Other vendors are attempting to establish similar positions, but are also using alternative strategies. Publicly held Raptor hopes to leverage a broad product line, direct sales force, and growing list of VARs. Border is stressing ease of use and is entrenching itself in Europe and Asia. Trusted Information Systems (TIS) and Secure Computing hope to transition from experienced government contractors to leading commercial firewall vendors. These varying dynamics will paint an interesting landscape for the remainder of 1996, but perhaps the biggest factor to watch this year will be Microsoft, which will soon enter the market with a Windows NT product that is likely to take the firewall battle to a new level.

Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

High Availability Computing Reaches the Mainstream

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High availability (HA) is becoming more important as the 7 × 24 international business model proliferates. The downward price pressure and availability of commodity HA components put those solutions within the reach of more potential customers. However, as the number of product choices increases, so too does the customers' confusion regarding a most appropriate choice of HA solution.

Over the last 30 years all aspects of IT have steadily become more affordable and as a direct result more pervasive. As IT solutions were more tightly integrated with overall organizational operations, the availability of that processing infrastructure became paramount to the enterprise. Prior to 1990, businesses had two primary, and limited, choices for the solution of their availability problems. The first solution was to use the best available standard products and hope for the best possible result. In this scenario the burden of providing a highly available (HA) solution fell onto the shoulders of the professional in-house IS staff. The second choice was to buy either a highly customized, and costly, solution from a systems integrator or a fault-tolerant solution from a vendor like Tandem, Stratus, or Sequoia.

The difficulty and cost of such solutions curtailed the growth of HA solutions. They were relegated to those enterprises that required maximum availability for competitive survival, such as financial institutions. Today's generation of highly available system offerings adds cost-effective alternatives attractive to a range of enterprises and users. Now, when the impact of a system outage on the productivity of numerous highly paid knowledge workers is added into the equation, it is possible to cost-justify many of these solutions.

Highly available computer systems are currently in the forefront of IT growth. A computer system is considered to

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be highly available if, when a fault or failure occurs, data is not lost, and the system can recover in a reasonable amount of time. Highly available systems consist of hardware and software designed to protect against component and system-level failures. In the event of a failure, the system recovers through a fail-over process, after which users get back on line, having experienced some limited amount of downtime. The complexity and cost of these highly available solutions is dependent on the types of services provided, the number of users, and user perception of what comprises an acceptable as compared to an unacceptable service outage. As businesses become more internationalized, 7 × 24 access to computer systems is a requirement. E-mail, groupware, and similar types of services are becoming business critical; as a result, highly available systems are now needed by many more organizations.

The convergence of open systems with commodity-priced hardware and software, experience building highly available solutions, business internationalization, messaging product proliferation, and the need to access centralized data will force HA system features into LAN servers. A total of 32,118 HA system units were shipped worldwide in 1994 for a value of $11.0 billion. In 1995 shipments of 40,103 HA system units were shipped worldwide, but valued at $11.7 billion. This represents a growth in shipments from 1994 to 1995 of 25% and a growth in the value of shipments of 6%. These trends are expected to continue as the volume of shipments accelerates, driven by downward price pressures resulting from competition and production efficiencies.

To promote better understanding of the underlying technologies of the developing HA market, this issue of *The Gray Sheet* presents IDC's Availability Spectrum, which segments HA solutions into four distinct technology categories in an effort to distinguish among the varying levels of availability offered by vendors. Following is an analysis of the HA market that reviews 1994 and 1995 results and discusses prospects for the market for the remainder of the decade.

THE AVAILABILITY SPECTRUM

Terms are imprecise, making it difficult for users (read: customers) to get (select) the appropriate amount of "HA" to support their business requirements.

IDC created its Availability Spectrum as a tool to sort out the plethora of marketing statements for highly available systems coming from almost all computer system vendors. These statements — often supported by feature list tables designed to knock off competitors rather than to be comprehensive or informative — create market confusion and blur the meanings of such overused terms as "highly available," "fault resilient," "fault tolerant," and "continuous availability." These terms have been used interchangeably to the point that they no longer convey precise messages in the marketplace.

IDC's Levels of Availability Spectrum

Availability Level	Impact on a Priority User upon Failure of Any Component	System Protection Features
Availability Level 4 (AL 4)	Transparent to user; no interruption of work; no transactions lost; no degradation in performance	100% component and functional redundancy
Availability Level 3 (AL 3)	User stays online; current transaction may need restarting; may experience performance degradation	Automatic fail-over transfers user session and workload to backup components; multiple system connections to disks
Availability Level 2 (AL 2)	User interrupted, can quickly relog on; may have to rerun some transactions from journal file; may experience performance degradation	User work transferred to backup components; multiple system access to disks
Availability Level 1 (AL 1)	Work stops; uncontrolled shutdown; data integrity ensured	Disk mirroring or RAID and a log-based or journal-file system for identification and recovery of incomplete in-flight transactions

Source: International Data Corporation, 1996

The Availability Spectrum is a test based on pass/fail functional criteria. A proposed Availability Level Four (AL 4) solution must meet the user impact requirement of no interruption of work, no transactions lost, and no degradation in performance. Typically, this result is accomplished through "100% component and functional redundancy."

The IDC Availability Spectrum provides an unambiguous basis on which to rank HA offerings.

This new approach provides a clear and comprehensive vendor-neutral view of HA systems. How the system is used (print server or OLTP engine) may dictate the best technology to achieve a given level of uptime. Our goal is to provide a set of unambiguous criteria to rank each vendor's highly available solutions. The approach was conceived in conjunction with all major systems vendors and has carefully considered their comments, which are conflicting at times. All of the major HA system vendors have shown great interest and fundamental agreement with the user-oriented approach. Over time, refinements to the IDC Availability Spectrum may be required; perhaps one or more of the levels will be subdivided. In all cases, any such changes will be rationalized from the user's perspective.

HIGHLY AVAILABLE SYSTEMS

Highly available systems have various levels of complexity. On the low end, the required capability can be provided through a journal-based file system, including capabilities found in database products and transaction processing monitors combined with disk mirroring or a RAID (Redundant Array of Inexpensive Disks) storage subsystem. Residing on the extreme high end of the availability spectrum are solutions traditionally provided by vendors like Tandem and Stratus and frequently referred to as fault-tolerant systems.

Each successive level incorporates all of the functionality of the preceding level.

The IDC Availability Spectrum defines four levels of highly available systems, with availability level one (AL 1) as the lowest level. Each successive level incorporates all of the functionality of the previous level.

Once a failure and recovery have occurred, the system will no longer be at its original availability level.

For each availability level, once a component failure and subsequent system recovery have taken place, the system is no longer considered to be at its original availability level until the failed component is replaced. (The system may have redundancies that ensure fail-over capabilities in the event of additional component failures.) As a direct result of the increased load on the remaining functioning components, end users normally notice some performance degradation.

HA Systems Revenues: Summary Data for Unix and NT by Vendor, 1994 and 1995

	1994		1995		1994–1995
	Value ($M)	Share (%)	Value ($M)	Share (%)	Growth (%)
NCR	463.8	31.1	662.5	33.7	42.8
IBM	151.6	10.1	219.8	11.2	45.0
Tandem	199.3	13.3	215.2	11.0	8.0
Hewlett-Packard	125.2	8.4	181.5	9.2	45.0
Stratus	143.0	9.6	111.0	5.7	-22.4
Sequent	79.4	5.3	95.3	4.9	20.0
Sun Microsystems	60.6	4.1	78.8	4.0	30.0
Digital	43.1	2.9	77.5	3.9	79.8
Silicon Graphics	41.1	2.8	70.7	3.6	72.0
Auspex	33.6	2.2	48.7	2.5	44.9
Tricord	33.3	2.2	46.6	2.4	39.9
Compaq	34.3	2.3	46.2	2.4	34.7
Siemens/Nixdorf	22.1	1.5	28.7	1.5	29.9
Netframe	19.5	1.3	27.3	1.4	40.0
Data General	20.0	1.3	23.2	1.2	16.0
Unisys	10.4	0.7	10.4	0.5	0.0
ICL	5.9	0.4	8.9	0.5	50.8
Sequoia	7.4	0.5	8.2	0.4	10.8
Groupe Bull	0.0	0.0	3.1	0.2	NA
Chen Systems	0.0	0.0	1.0	0.1	NA
Total	1,493.6	100.0	1,964.6	100.0	31.5

Source: International Data Corporation, 1996

AVAILABILITY LEVEL DEFINITIONS

IDC's AL levels are a tool for understanding HA solution capabilities and customer requirements. They are a stake in the ground in terms of developing a universal set of HA standards.

HA system features make data loss less likely if either a component or a system experiences a failure, a significant fault, or a transient failure. For a system to be considered highly available the base requirement is that, when a failure occurs, at least a backup copy of data is available on a redundant disk and a log-based or journal-file system exists for identification and recovery of incomplete transactions. This represents the AL 1 level of availability. It should be noted that this model focuses on combined hardware and software solutions. Software-only solutions that run on multiple hardware platforms (e.g., Novell's NetWare SFT) have not been included.

AVAILABILITY LEVEL ONE

With AL 1, users would experience an uncontrolled system shutdown or crash wherein all work stops, but data is recoverable and consistent.

The criteria for AL 1 solutions are designed to ensure that data is neither lost nor corrupted by a system failure. An AL 1 solution must have some level of redundancy of disks (RAID arrays or mirrored disks) and a log-based or journal-file system. This latter capability may

be part of the database system or transaction processing monitor. This type of software ensures that partial transactions are not written to disk and that the data is consistent (either the entire transaction is recorded or none of it is).

In the case of AL 1 systems, a user would experience noticeable downtime or significant disruption of service, during which time the system would be taken off line, restarted, restored to a consistent state (if necessary), and then made available to users. Manual reconfiguration and redistribution of the workload is required to compensate for certain hard failures such as in a CPU or memory subsystem.

AL 1 solutions don't require that backup components exist for off-loading work. The requirement simply is that all data be recoverable and consistent. AL 1 solutions ensure that previously completed work is never lost.

AVAILABILITY LEVEL TWO

With AL 2 users would be interrupted and may have to log on again; some transactions may need to be rerun, and users may experience performance degradation.

An AL 2 solution has sufficient redundant elements as well as recovery procedures that allow work to continue without requiring the repair of broken elements. (User sessions and workloads are transferred to backup components or nodes.) After failure, users would log back into the network, reestablish their IP (network) address, and then reenter any lost transaction or one that was in flight at the time of the failure.

After a fail-over involving an AL 2 system, users may experience some degradation in performance as the workload from the failed component is redistributed to the system's functioning elements. Usually AL 2 fail-overs are completed within 30 minutes. The recovery time is determined by a number of factors, including size of the system, number of LAN and WAN connections, and the nature of the failure.

Although the system is capable of operating in a degraded mode, the activities needed to restore the system to its original AL 2 level may require unexpected downtime. For example, does the repair or replacement of the component require the system to be powered down? Can the operational software increase the capacity of the system (e.g., add another disk or more memory) without a reboot?

AVAILABILITY LEVEL THREE

With AL 3 users would stay online, only the current transaction may need restarting, and users may experience performance degradation.

An AL 3 solution provides failure recovery that can be transparent to the user. As in an AL 2 solution, user sessions and workloads are transferred to backup components or nodes. However, this occurs quickly enough that the user session is not dropped. The only action that a user need take might be to reenter a lost transaction or one that was in flight at the time of the system or component failure. AL 3 systems typically have redundant hardware subsystems with software providing monitoring and fail-over functions. After a fail-over, users may experience some degradation in performance as the workload from the failed component or system is redistributed to the system's functioning elements, but in many cases this will not be noticeable.

Both AL 2 and AL 3 systems provide N+1 redundancy. Rather than the provision of one-to-one sparing, there is only a guarantee that more than one of each critical component exists (CPU, disk, disk controller), eliminating any single point of failure. AL 3 systems have a long history. The earliest examples were "hot standby" systems. These systems were either not used at all or used for background noncritical applications. When one of the main systems failed, peripherals were switched to the standby system, and it would then resume processing the workload.

AVAILABILITY LEVEL FOUR

With AL 4, users would experience no interruption of work and no performance degradation, and they would stay online. A system failure would be completely transparent to the end user.

There are two main approaches to providing AL 4 functions: one is implemented primarily through hardware and the other through greater software content. The hardware approach requires more than one processor running in a lock-step mir-

rored mode, simultaneously processing identical instructions and periodically checking for processor accuracy. In the case of a failure, the faulty processor shuts off, and the remaining one simply continues processing. There are multiple paths from processors to I/O devices, and when a device fails, a new path or device is automatically selected.

Any single failure in an AL 4 solution will be transparent to the users of the system, will be fully recoverable, and will incur no performance degradation. AL 4 solutions have more typically been referred to as fault-tolerant solutions and to date are most notably produced and implemented by Stratus, Tandem, and Sequoia. These solutions typically involve proprietary or heavily customized Unix operating systems and other AL 4 enabling software.

Originally, AL 4 solutions were one-of-a-kind solutions funded primarily by the government for life-threatening, critical situations (involving the military, manned space flight, etc.). The first commercial systems, like most of those of the era, consisted of proprietary hardware architectures combined with proprietary operating systems. These systems provided vendors with a wealth of experience that has been used to carry this level of availability into open systems.

The price of an HA solution should be considered in terms of the cost of a system failure.

Historically, one of the more significant differences between AL 4 HA systems and AL 1 through AL 3 products has been their respective impacts on the purchaser's pocketbook. However, the cost of an AL 4 HA system should be viewed in perspective with the problem it solves. In other words, if even a few minutes of either planned or unplanned system outages per year would cost more than the difference in price between an AL 1 through AL 3 system and a high-end fault-tolerant solution, then the decision to purchase an AL 4 system should be automatic.

AL 4 systems typically employ what is referred to as 2N redundancy. That is, every system component required to execute the critical application has a spare that can be pressed into service if the original fails. Each element also has redundant paths. The only time performance degradation could occur in an AL 4 solution is during the recovery procedure when data is copied to a replacement disk (the case of one member of a mirrored data set failing) or a mirrored memory. (Of course, AL 1 through AL 3 solutions also share this potential for performance degradation.) Most AL 4 systems provide data integrity checking throughout the entire data path from terminal to disk, thereby ensuring that data is never corrupted or lost.

The second approach to providing AL 4 capability also requires additional hardware. The level of duplication is not as great, frequently looking more like an AL 2 or AL 3 solution. However, the software AL 4 solutions require fail-over scripts unique to the site and application. They also require modifications to applications to enable them to fail-over to another system when the system on which they are running fails.

THE HA SYSTEMS MARKET — 1994 AND 1995

In 1994, the number of highly available systems shipped was 32,118, at a value of $11.0 billion, and in 1995 the number was 40,103, at a value of $11.7 billion. These changes represent a growth of 25% in the overall number of HA shipments and a growth of 6% in the value of shipments. Shipments of HA systems in the proprietary portion of this market for 1994 were 10,914 at an estimated value of $9.5 billion. In 1995 shipments were 10,261 at an estimated value of $9.7 billion. These drops represent a negative growth of -6% and a revenue growth of 2%.

However, all is not lost, as is indicated by an examination of the Unix and NT portion of the HA marketplace. For Unix and NT, 1994 shipments of 21,204 units were valued at $1.5 billion, and in 1995 HA shipments of 29,842 were valued at an estimated $2.0 billion. This increase represents a growth in shipments of roughly 40% and in revenue of 32%. Users are clearly looking for and finding Unix/NT-based open-system alternatives to the more traditional and proprietary HA solutions. We expect these trends to continue as the volume of shipments accelerates because of downward price pressures resulting from competition (Unix/NT competing against higher-priced proprietary offerings) and production efficiencies.

HA System Shipments: Summary Data for Unix and NT Systems by Vendor, 1994 and 1995

	1994		1995	
	Units	Share (%)	Units	Share (%)
NCR	5,684	26	8,120	27
IBM	3,330	15	4,828	16
Hewlett-Packard	3,226	15	4,678	15
Digital Equipment	1,875	9	2,963	10
Sun	1,618	8	2,103	7
Compaq	965	4	1,300	4
Siemens Nixdorf	796	4	1,035	3
Tandem	750	3	810	3
Tricord	543	3	760	3
Data General	546	3	669	2
Netframe	420	2	588	2
Stratus	299	1	268	1
ICL	272	1	408	1
Unisys	268	1	348	1
Auspex	204	1	296	1
Silicon Graphics	176	1	278	1
Sequent	212	1	254	1
Groupe Bull	0	0	100	0
Sequoia	20	0	22	0
Chen Systems	0	0	14	0
Total	21,204	100	29,842	100

Source: International Data Corporation, 1996

The top five market leaders in the Unix/NT portion of the HA market in terms of the number of highly available systems shipped for 1994 and 1995 were NCR, IBM, HP, Digital, and Sun, in descending order. The vast majority of new shipments in the highly available system market were for AL 1 systems: 57% of Unix/NT HA system shipments in 1994 and 54% of the total shipments in 1995.

Growth in shipments of high-end HA systems will continue to slow when viewed in perspective of the total HA market.

Growth in shipments for highly available systems will be slower at the predominantly proprietary high end of the market (AL 4), with most of the growth occurring in Unix/NT-based AL 1 through AL 3 systems for the next several years. This growth will be driven by new product offerings and the enhancement of existing products, which will lift them from one availability level to the next. One area of significant shift — as related to percentage increase over previous years — will occur between AL 2 and AL 3.

For the next several years, the lower end of the market (AL 1) will experience more dynamic growth than the traditionally proprietary system-based higher end (AL 4) in terms of the number of HA systems shipped each year. Total HA system shipments will grow on average 30% to 45% for the entire Unix/NT portion of the

HA system market (AL 1 through AL 4) over the next several years.

There will be a significant shift in the market to loosely clustered systems by 1998 to the point where a majority of highly available system shipments will be clustered systems. This shift will accelerate with the addition of new higher-speed and higher-bandwidth interconnect technologies that will ultimately facilitate enterprisewide clusters. One clear driver in the move toward remotely clustered (geographically dispersed) system architectures will be the installation of full-blown ATM capabilities as part of a new data communication infrastructure (the Information Autobahn). This capability will set the stage for the creation of disaster-tolerant clusters — allowing business operations to continue in the face of natural disasters such as fires, earthquakes, hurricanes, and massive power or telephone outages.

A geographically remote site, through cluster technology and high-speed interconnects, is kept current with the operational system. In the event of a disaster at the site of the operational system, the remote system can easily pick up the operational load. Consequently, a main site in Boston, Massachusetts, could have as part of its highly available system cluster a server or series of servers in Framingham, Massachusetts, or elsewhere in the world. Digital has an option like this today with its Gigaswitch technology combined with its existing cluster technology. As data communications infrastructures improve on a global basis, organizations will find themselves no longer constrained to a single geophysical location for their IS resources.

Evolving Market Dynamics

Will the more traditional HA vendors be able to shed their high-cost proprietary approach in favor of a more open shrink-wrapped set of HA product offerings?

The high growth rate in the HA system market is due to decreasing component costs and greater choices in technologies at increasingly lower price points.

The movement in the HA system market is toward cheap, cost-effective, commodity-type hardware in a redundant configuration utilizing system software or middleware as the glue that holds it all together.

Will the new low-cost, open system-based HA providers be able to deliver enterprise-level bet-your-business AL 3 and AL 4 solutions?

The more traditional AL 4 fault-tolerant-only vendors are being forced to move into the lower-end HA system market (AL 1 through AL 3) so as to continue to grow their businesses.

The answer to both of these questions in the future will be an emphatic yes!

LAN server consolidation is a driver for the purchase of many HA systems. Pressure is growing to centralize LAN server management on the part of IS professionals and their organizations.

1996 and Beyond

Nineteen ninety-six will see the introduction of high availability system features and functions into the lower end of the market. Smaller high-growth firms that previously neither felt the need nor had the financial ability to afford an HA system are expected to constitute a new market for these systems. As the small companies of today grow into the Fortune 2000 of tomorrow, the vendors first through the customers' doors with the most appropriate solutions will become the owners of entrenched and potentially lucrative relationships.

This issue was adapted from Highly Available Systems, *IDC report #11503. For more information, contact Gene Lee at 415-962-6421.*

Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

Milestones for the Global Information Revolution: An Information Society Index

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October 1, 1996

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What if we had a revolution and no one could come?

The world is at the brink of a historical watershed in human interaction. The Global Information Revolution, by leveraging digital media convergence, computer hardware and software improvements, and new types and levels of communication links, promises nearly instantaneous two-way access to an unprecedented spectrum of information types.

For individuals, the ultimate goal is a new pinnacle of empowerment. They will be able to choose their own cultural communities from which to draw emotional and intellectual sustenance and to which they can contribute (as they develop) their creative potential. If we're all very lucky, the results could approach the consequences of the first modern information revolution ramifying from the invention of the printing press.

The short-term goal, though, is staying afloat. After all, as literacy became more important after books could be mass produced, it had economic implications as well, accentuating divisions within and between societies. Just as literacy became the union card for participation in a modern Western economy, access to the Global Information Revolution will soon become necessary for individuals to play an active role in the emerging world economy. The investments that banks are now planning for online capabilities are an early warning sign of the economic consequences of shifting from "atoms" to "bits."

But just how big a challenge do we face? To begin to get a handle on the problem, IDC and the World Times, one of its sister companies within the IDG family, decided that the first step should be the creation of a single set of metrics that could measure how effectively individuals could access, absorb, and utilize information available on the new technologies.

We have now learned that the challenge is indeed monumental, yet in most cases not forbiddingly onerous:

- The disparity between the extremes is wide. The best score against the metrics was 16 times higher than the low score, which would have been much lower still if more low-per-capita IT spending countries had been included in the

THE GRAY SHEET

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data runs for this first go-around.

- No one can be complacent. Even the highest-scoring nations showed areas of noticeable weakness, and they are impeding their citizens' ability to compete in the future global economy.
- Most of the elements under measurement, however, are highly dynamic. They can and will change, generally for the better.
- Some countries will develop faster than others because certain criteria can be improved upon faster than others.

The initial results were presented last June as the IDC/World Times Information Imperative Index at the first World Times Information Imperative international conference in Washington, DC. A full analysis of the results has just been published as *Toward the Third Revolution: The 1996 IDC/World Times Information Imperative Index*. Both companies are committed to revisiting the data at least once a year.

So far we've been referring to the Information Imperative Index, with the accent on imperative — the decisions that governments and other critical participants make over the next few years will go far toward determining the information haves and have-nots of the next century. Maybe a better way of thinking about it would be to call it the Information Society Index because it will indicate just how fast and how effectively different societies will make this crucial transition.

The Index required drawing on the strengths of both companies. IDC provided its expertise in computer and Internet market trends, and it capitalized on its unparalleled network of local expertise in information technology activities on six continents. The World Times brought a broad understanding of critical social and economic issues facing nations today, with particular concern for the effects of the Global Information Revolution. The 55 countries represented in this first iteration of the Index constitute the total of nations in which IDC, the World Times, or both had offices or publishing partners.

BUILDING AN INDEX

We knew from the outset that an Information Society Index had to incorporate a broad spectrum of data sets. Any index of factors accelerating or retarding progress toward an information society must begin, of course, with technology development — PCs and telecommunications equipment, for example — but just speeds and feeds are not all that count. Attitudes, and how they are translated into legal and cultural barriers, will matter as well.

The first steps in creating the Information Society Index were a series of regression analyses for more than 40 possible variables against IT spending per GDP. Twenty unique factors were chosen for the Index, based on a mixture of the regression analyses and the participating analysts' views of the contours of the future IT industry. The variables simultaneously focus on individuals, whose information empowerment is the goal, and on states, which must invest in the technological, social, and legal structures that can allow their citizens to take advantage of the new technologies.

The 20 variables were then grouped into three infrastructure categories: the **social infrastructure**, the **information infrastructure**, and the **computer infrastructure**.

The social infrastructure is the irreducible minimum of preconditions for individuals' effective utilization of the technologies cited in the other two groupings. The first three factors center around education and practical literacy. The other two deal with the freedom to access and make use of technology:

- Secondary education
- Tertiary education
- Newspaper readership
- Press freedom
- Civil liberties

The variables in the information infrastructure represent noncomputer technologies that will be used by, or may be replaced by, the digitized technologies of the Global Information Revolution. They include both business and individual entertainment media because both types of information will be incorporated into future digital formats:

- Telephone lines
- Telephone faults
- Radio ownership
- Television ownership
- Fax ownership
- Cellular phone ownership
- Cable/satellite television access

The third grouping looks at the computer, specifically the PC and the Internet, which already have become the information superhighway that seemed mostly hype just two or three years ago. This grouping is the avatar of the Global Information Revolution:

- PCs installed
- Home PCs shipped
- Government/commercial PCs shipped
- Education PCs shipped
- Percentage of PCs on networks
- Software/hardware ratio
- Internet providers
- Internet hosts

Next the Index elements required weighting so that small nations could be realistically compared with large. Thus, most of the variables were standardized against a rational metric (e.g., televisions or fax machines per capita, telephone lines or home PCs per household).

Then the resulting numbers were standardized on order of magnitude because otherwise the data as developed would be biased toward the most common technologies (e.g., radios would vastly outweigh faxes in importance); the solution was to bring all 20 factors to roughly comparable positions at their mean, at around 100. The effect of this exercise was to bring the average for all variables into roughly the same level of importance.

OVERALL SCORES

The 55 countries profiled by the 1996 Information Society Index account for a significant swath of the earth's people and wealth: 77% of the world's population, 97% of the global GDP, and over 99% of all using information technology. Yet the discrepancy between the proportions of population and GDP or IT spending is an early warning signal that the distance between high and low scores in the Index was to be dramatic.

The United States scored highest in the 1996 ISI, with 5,107 points; China fared the worst, with 335. In theory there is no limit to the ceiling of a nation's ISI score, but if the best reported scores in each category are combined, the best possible total for 1996 was 6,239; the worst was 189. In other words, even at the highest score, the United States totaled only 82% of the best of what all countries are currently capable of. The country with the lowest score, China, did 77% better than the total low scores for all 55 countries — and that was with a distinct underrepresentation of underperforming economies.*

IDC and the World Times have grouped the 55 countries by their overall Index scores, from the United States down to China, into four separate groups.

The lowest scores are in **Group IV**, which ascends to a total of 1,000. Although the scores are low, these have been and will continue to be high-growth markets, where economies and IT prospects are experiencing the tremendous thrust, and enormous resistance, of a rocket launch. Whereas information technology growth rates are frequently exciting, they are also often uneven, for opportunities must confront obstacles accreting through centuries of inertia. Average citizens can expect a long wait before they will be able to take full advantage of the Global Information Revolution.

* Because the 55 countries selected for the Index had either a sufficient computer infrastructure to merit IDC's investment in a permanent research capability or a potential readership for the social and economic analyses of the *World Paper*, they are inevitably skewed toward mature or rapidly developing economies. This situation can be seen in a comparison of the 55 to the 210 countries classified as low income, lower-middle income, upper-middle income, or high income in the World Bank's *World Development Report 1996*. Overall, the Index accounts for 26% of all countries, but this figure breaks down to 56% of the 45 with high incomes, 31% of the 35 with upper-middle incomes, 23% of the 66 with lower-middle incomes, and only 6% of the 64 with low incomes.

Information Society Index Composite Results, 1996

Country	IDC/WT Index	Country	IDC/WT Index
Group I		**Group III (continued)**	
United States	5,107	Greece	1,377
Sweden	4,003	Portugal	1,301
Group II		Argentina	1,215
Denmark	3,842	Chile	1,181
Norway	3,755	Poland	1,159
Finland	3,722	Bulgaria	1,069
Australia	3,704	Venezuela	1,050
Canada	3,494	South Africa	1,043
Switzerland	3,459	Russia	1,041
New Zealand	3,363	**Group IV**	
United Kingdom	3,148	Malaysia	990
Netherlands	3,099	Brazil	961
Germany	2,970	Costa Rica	952
Japan	2,970	Panama	918
Hong Kong	2,893	Mexico	871
Austria	2,640	Romania	862
Singapore	2,516	Saudi Arabia	850
Belgium	2,475	Colombia	755
France	2,296	Thailand	725
Israel	2,225	Ecuador	695
Italy	2,070	Jordan	695
Taiwan	2,053	Turkey	695
Korea	2,008	Peru	651
Group III		Philippines	632
Ireland	1,922	Egypt	586
Spain	1,872	India	435
UAE	1,618	Indonesia	387
Czech Republic	1,528	Pakistan	371
Hungary	1,500	China	335

Source: International Data Corporation/World Times, 1996

Group III members scored between 1,000 and 2,000. In these countries the obstacles to change, while still troublesome, have diminished to the point where opportunities typically outweigh them, and information technology growth is, with few exceptions, vigorous and consistent. Nevertheless, the obstacles that remain are sufficiently onerous that many citizens will often not be able to take advantage of the fast-paced growth.

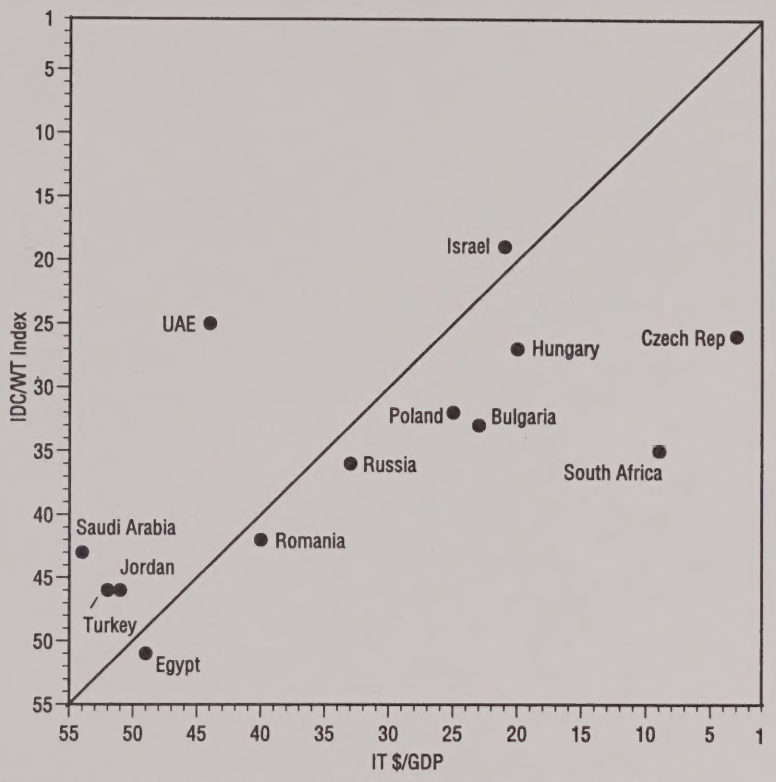
Group II members scored between 2,000 and 4,000. Western European nations constituted more than 50% of Group II. In this segment, information technology has soaked into the economic fabric and grows more or less in tandem with the economy as a whole — indeed, recently often less in Japan and much of Western Europe. Suddenly limits on computer absorption rates may reappear and with them the first glimmer of doubts about the meaning of the revolution.

When the United States went through this phase in the late 1980s, one symptom was the anxiety about an apparent "productivity paradox," which seemed to indicate that productivity was unrelated to, or even negatively correlated with, investment in information technology. The Index scores suggest, however, that a number of factors have prevented these countries from taking full advantage of the productivity gains possible through IT. These factors will also blunt the full impact of the Global Information Revolution unless they are adequately addressed.

Group I members had Index scores of 4,000 or better. Membership in Group I, in fact, signals a paradigm shift toward the information superhighway, or the "third wave," which renders the usual comparisons irrelevant. In this new stage, information access has leapt the narrow confines of economic productivity to enter the lives and development of individuals within the economy and has begun to display growth patterns that are not constrained (although still affected) by overall economic performance.

There is no "natural pace" at which progress through these phases must proceed. Investment in key elements — such as secondary education and the telephone infrastructure, support for faster absorption of PCs in the homes and schools, and recognition of the critical importance of software for broader, more meaningful use of computers — can significantly shorten the gap between phases.

1996 ISI Score Rankings Vis-à-Vis 1994 IT/GDP Rankings by Country in Eastern Europe/the Middle East/Africa



Source: International Data Corporation/World Times, September 1996

Regional Cues

Western European nations consistently received stronger-than-average scores, and perhaps not coincidentally the region as a whole has a large population-to-IT spending gap. The Asia/Pacific region, which includes 56% of the world's population but only 24% of its IT spending, finds half of its nations in Group II and the other half entrenched in Group IV.

Although the gap between the dispersal of the earth's population and the production of its wealth is wide, the gulf between population density and spending on information technology, as measured by IDC, often yawns even wider.

Population pressure effectively divides the Pacific Basin into two very distinct groups within the Index. Countries in the Asia/ Pacific region are either becoming well-established launch pads for the Global Information Revolution (Australia and New Zealand, Japan, and the Four Tigers: Hong Kong, Singapore, Taiwan, and Korea) or are still weighed down by the issues of the past, such as overpopulation, underdevelopment, and/or anti-individualistic political and social practices (China, India, Indonesia, Malaysia, Pakistan, the Philippines, and Thailand).

Population and attendant development issues combine to keep Latin American scores down in Groups III and IV. On average, they are lower than any other of the regional groupings, but the reason is primarily that Eastern Europe was linked with the Middle East and Africa due to the paucity of African countries profiled. Eastern Europe is well on its way toward casting off the detritus of its past, and if the Index had included as many countries in Africa as in Latin America, there is unfortunately no question as to which region would fare worse (of the 64 low-income economies cited in the World Bank's *World Development Report 1996*, 59% were in sub-Saharan Africa).

Nations in Western Europe and North America consistently received stronger-than-average Index scores, and perhaps not coincidentally citizens in both regions are simultaneously investing in IT and keeping population growth under control.

ALWAYS ROOM FOR IMPROVEMENT

All countries have weaknesses that can be rectified, and even those with the lowest scores can dramatically improve the ability of their citizens to participate in the Global Information Revolution.

IDC and the World Times compared the rankings of the countries in the 1996 Information Society Index to their relative positions, 1 to 55, in the proportion of the gross domestic product that is allocated to information technology spending as measured by IDC.

At either extreme, the gap points to significant discontinuities within countries that will almost certainly adversely affect the speed with which they can more fully participate in the global information revolution.

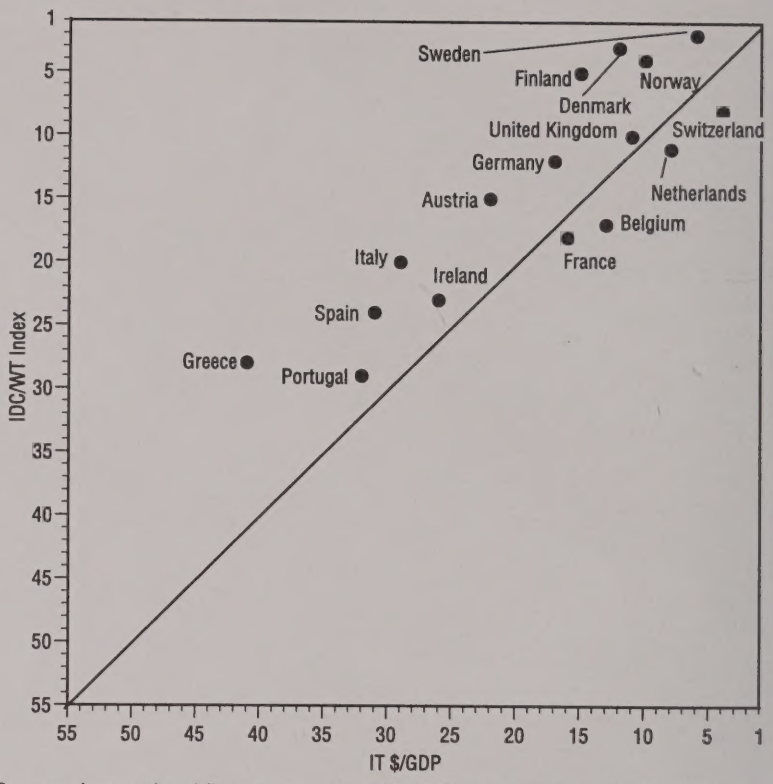
A significantly higher ranking for IT/GDP than for ISI scores suggests that a particular country is not effectively positioning its IT expenditures to exploit the new information technologies and the PC paradigm and/or that its social and information infrastructures are out of balance with its computer infrastructure.

A significantly higher ranking for ISI scores than for IT/GDP suggests an imbalance to the detriment of the computer infrastructure.

Most of the countries in Eastern Europe and the Middle East/Africa are not exploiting the PC paradigm or are lacking in their social or information infrastructures. The majority of Western European countries need to make improvements to the computer infrastructure.

However, the middle is not necessarily a happy medium, for consistency in rankings is not a plus if the two rankings are consistently low. For that reason, we have cast the data as scatter charts in which the desideratum is a point along the diagonal in the upper right (the diagonal represents the absence of any gap between the two rankings, the upper right indicates high scores for both). Countries in this position have both the broad spending patterns and the specific goals to permit a rapid movement toward the new technologies necessary to implement the Global Information Revolution.

1996 ISI Score Rankings Vis-à-Vis 1994 IT/GDP Rankings by Country in Western Europe



Source: International Data Corporation/World Times, September 1996

THE VELOCITY OF CHANGE

The variables in the ISI are highly dynamic. Many elements in the information and computer infrastructures are evolving rapidly and could generate significant changes over the next few years. Within the information infrastructure, the telecommunications variables (telephone lines per household and faults per line) are essential. Improvements in this area will have a multiplier effect on other elements, such as fax and Internet usage. Because the Global Information Revolution is closely tied to the individual exchange of digitized information, individual access to personal computers also is essential to successful development.

Some countries are in position to develop faster than others because certain ISI criteria can be improved faster than others. High-impact actions likely to lead to short-term improvements include increasing the number of telephones and Internet hosts. Although investing in secondary school education takes longer to implement than many other investments, ultimately the multi-

plier effect of such education investments can be greater.

THE JAPAN EXAMPLE

Among the examples of current Index shortcomings and potential for change, few are as striking as Japan; consequently, its standing should improve significantly as it changes its emphasis toward networked single-user systems.

Japan's relatively weak computer infrastructure, which pulls down its overall Index ranking, is the result of its having invested so much for so long in IT solutions that will not make the transition into the Global Information Revolution. For the past two decades Japan has been characterized by a much stronger investment in mainframe solutions than has been typical in North America or Western Europe. Only in the past two years have Japanese businesses and consumers begun to embrace the PC with the same enthusiasm seen in other world-class economies.

The sudden shift in Japanese buying patterns toward networked single-user systems and rapidly increasing use of the Internet surely will raise Japan's relative Index ranking in future years. In fact, if Japan had equaled U.S. scores in the PC-related categories, it would have improved its overall ISI score by 820 points and landed in fourth place in the rankings. Instead, Japan's ISI score for PCs installed per capita (106) was 172 points behind that of the United States; its score for PCs shipped to the nonagricultural workforce (103) was 305 points behind; and its results in the remaining PC categories also lagged substantially.

THE CHALLENGE

Digitally mediated information and information services are rapidly entering the mainstream from the realm of the exotic. Yet the gulf between rich and poor is wide indeed, and the process of moving forward is only partially understood. The IDC/World Times Information Society Index sheds additional light on the details of how and when countries around the world will become fully participating information societies.

The good news is that information, unlike most economic goods, is

Japan ISI Ranking by Variable, 1996

Variable	Score	Rank	III High	III Low	III Mean
Secondary school enrollment	96	5	100	19	73
Tertiary school enrollment	62	11 (tie)	124	4	52
Newspaper readership	100	1 (tie)	100	25	63
Press freedom	99	1 (tie)	99	3	74
Civil liberties	90	2 (tie)	105	15	77
Social infrastructure	447	12	496	91	338
Telephone lines/household	138	10	190	4	88
Telephone faults/line	91	4	200	1	21
Radio ownership/capita	228	9 (tie)	530	20	139
Television ownership/capita	610	3	814	16	279
Fax ownership/capita	483	2	540	1	117
Cellular phones/capita	173	15	790	–	142
Cable/satellite TV coverage	100	1 (tie)	100	36	84
Information infrastructure	1,823	6	2,810	120	869
PCs installed/capita	106	19	280	1	85
Home PCs shipped/household	236	15 (tie)	649	–	147
Government/comm. PCs shipped/non-agric. workforce	103	21	408	3	96
Education PCs shipped/students and faculty	112	14	353	1	68
Networked PCs % of installed total	41	28	132	23	66
Software spending/hardware spending	66	29	208	17	91
# Internet service providers	11	11 (tie)	45	–	9
Internet hosts/capita	25	20	472	–	50
Computer Infrastructure	**700**	**19**	**1,810**	**84**	**612**
Information Society Index	**2,970**	**12 (tie)**	**5,107**	**335**	**1,819**

Source: International Data Corporation/World Times, July 1996

not affected by the law of diminishing returns. Spread information as broadly as you like, and you won't get a zero-sum equation: its effect is never diminished, and often enhanced. There doesn't have to be one set of winners and one set of losers. This means that investments in developing an information society will face fewer inherent restrictions than other efforts to leapfrog into the future.

And the process is well under way. One need only look at PC shipment rates in much of the developing world, or the emerging global consensus that telephone infrastructures should be open to competition in the interest of inexpensive and effective communications, to appreciate the extent of progress that future iterations of the Index are likely to measure.

But the time of decision is now. There need not be losers, but there almost certainly will be information haves and have-nots unless we embrace the goals laid out by the 20 variables in the Information Society Index.

GURU'S CORNER: INFORMATION SOCIETIES AND THEIR CITIZENS

In Plato there's a story about the man who supposedly invented writing. When he took his pictographs to the reigning Egyptian monarch for his support, the pharaoh was aghast: society at the time was based on people's memorizing, and these new hieroglyphics would become shortcuts eroding the cognitive skills that kept the surrounding culture from toppling.

Luckily for the rest of us, writing could be implemented without political support, but governments will play an essential role in effecting the Global Information Revolution. They will be responsible for the telecommunications and technology policies required for an effective, inexpensive hardware and software infrastructure; they bear the burden of educating their citizens to be able to make use of that infrastructure; and they will determine how open their societies will be to the free exchange of ideas that lies at the core of the Global Information Revolution. That's why the Information Society Index is organized around 55 national entities.

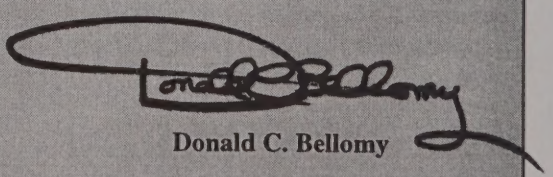
But the underlying yardstick for the Index is the individual: whether the individual has the educational tools to make use of and contribute to the new information infrastructure; whether the individual can own or have access to the necessary products and services that will define the new information society; whether the individual will be permitted the free and open dialogue with others throughout a network of global communities.

These notions have begun to create a tension and a temptation for today's pharaohs. Governments in countries such as Singapore and China would like to erect boundaries around their citizens' access to the Global Information Revolution — to create national intranets, if you will, with the same type of security restrictions on communications in and out that have come to characterize corporate implementations, only in the interest of existing cultural and political imperatives rather than of profits.

Pharaohs fear what philosophers tend to champion, and to exaggerate. Modernizing liberals from Voltaire through Victor Hugo and Mark Twain, for example, have lauded the effects of the printing press to liberate humanity from the tyranny of priests and kings. Yet the immediate effect of the printing press was not to mitigate the effect of religion on people's lives, but to accentuate creedal differences and to touch off a bloody cycle of religious wars. And if the printing press helped undermine hereditary power structures, it also facilitated other excesses in the name of new ethnic, social, and national categorizations.

Maybe the best way to view the social and political consequences of an information revolution, including the one now before us, is to recognize that they indeed tend to undermine holistic worldviews, but not the values (for good or ill) that underlie them. That is to say, they are inherently antitotalitarian, but the smaller communities that individuals may choose to create and join will not threaten existing social and cultural structures unless the powerful try to restrain their expression.

In other words, governmental efforts to rein in the Global Information Revolution are likely to generate exactly the kind of cultural discord that they are intended to prevent.



Donald C. Bellomy

(Donald C. Bellomy, is director of Worldwide Market Studies at IDC, a former *Gray Sheet* editor, and the principal IDC author of *Toward the Third Revolution: The 1996 IDC/World Times Information Imperative Index*.)

Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

PCs = Individuals?
China = 1 Billion Individuals ...

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November 15, 1996
IDC #12709
Vol. 31, No. 17

Almost any attempt to identify the world's leading suppliers of PCs in five years comes down to this: which PC markets worldwide will see the most incremental growth, and which vendors are poised to tap that growth?

The U.S. PC market is expected to grow by 12% annually from 1996 through 2000 to approximately 42 million units — an incremental growth of 16 million units shipped over 1996 levels. Consolidation at the top can be expected as a predictable set of rich vendors get richer. The bottom line: some, but not much, incremental opportunity awaits for suppliers seeking to crack the upper tiers.

But vendors seeking incremental growth may find it beyond the United States. Asia is hardly stable and may offer the most lucrative opportunity for PC suppliers. Asia will be the world's fastest-growing PC market at more than 20% compounded annually. It now accounts for 24% of the worldwide PC market and will grow to 30% in 2000. Global market leadership over the next five years may depend in no small part on suppliers' performance in Asia — meaning Japan and China.

Japan, about 50% of today's Asia/Pacific market, will see unit growth of nearly 19% through 2000. However, a preference for strong local suppliers limits the net opportunity for newcomers. The same is not true for China — its 5 million units in incremental growth from 1996 through 2000 will play a major role in establishing global PC leadership in 2000. This is good news for scrappy, cost-conscious suppliers because in China's PC market anything can happen.

Consider the following:

- China is showing huge incremental growth. If current forecasts hold true, the PRC will surpass Germany as the third-largest PC market in the world in 2000.
- Small changes in tactics and strategy in China can yield incredible returns quickly. Minor reductions in price result in huge gains in volume because of the price sensitivity of the consumer. Perhaps no market worldwide offers such an upside for opportunistic PC suppliers.

THE GRAY SHEET
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- Leadership in key growth segments — home and small/medium-sized enterprises, for example — is up for grabs. Small now, these markets together will account for approximately 61% of the 2000 market.
- China is largely unconsolidated today. No vendor holds double-digit share, and independent clonemakers thrive.

Like India, Russia, or Mexico, China offers a large population with little penetration. In short, China's PC market holds great opportunity, but vendors' successes will correlate with the dexterity they exhibit when addressing several issues. PC sellers entering the China market must decide with whom to partner; they must decide which channels to sell through, and they must identify to whom they're selling. Vendors that elect to manufacture in China face additional choices. Seldom does making PCs in China result in profit, but less tangible factors (government relations, fewer channel difficulties) can make a presence there worthwhile.

This issue of *The Gray Sheet* will examine China's promise and pitfalls for PC sellers looking to hit it big. By profiling China's market size, forecasting its growth, and elaborating on some of the idiosyncrasies associated with its immaturity, we will provide a clear view of why the PRC will play a critical role in the evolution of the world market for personal systems.

CHINA MARKET BY THE NUMBERS

Vendors anticipate big profit in China. Why? Population. In 1995, they shipped 1.5 million PCs into the country, a mere 2% of worldwide market share. Although that 2% is but a sliver of the world market, what's even smaller is the penetration rate it stands for in China: 0.1%. With 1.2 billion persons still without a PC, vendors are more than willing to pay China some attention.

Almost 1 million PCs were sold in China during the first half of 1996; 2.2 million are expected by yearend 1996. With compound annual growth of 32% through the turn of the century, the China PC market is forecast to be more than 6 million shipments in 2000. This figure will account for a more respectable 6% of world shipment share and 22% of Asia/Pacific share (including Japan).

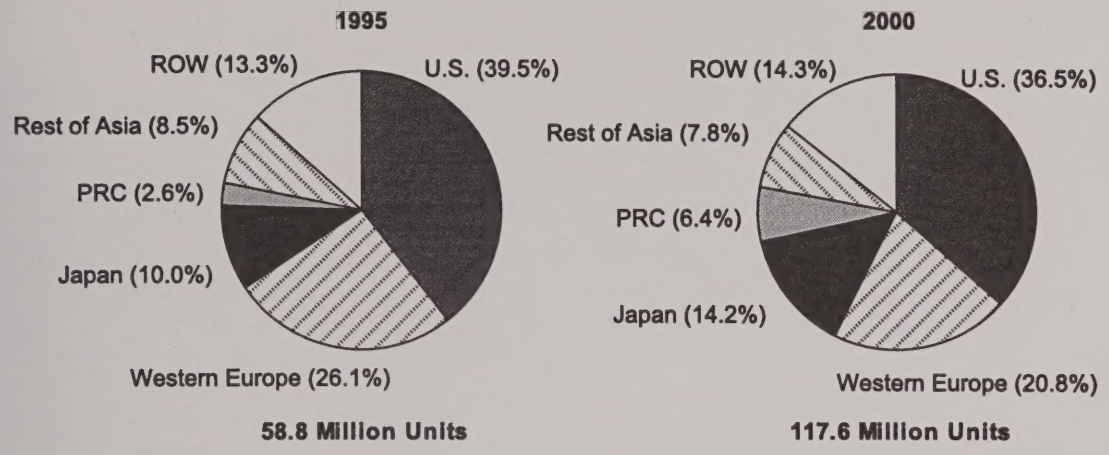
Undoubtedly some vendors will hit pay dirt in China's expanse, but it will be a wild and woolly existence. At yearend 1995, Compaq and AST, with 9.1% and 8.9% shipment share, respectively, held a slim lead over third-place Hewlett-Packard (6.0%). IBM was fourth, with 5.7%. By 1H96, those rankings completely changed.

At midyear 1996, IBM held the shipment share lead, at 7.1%. Compaq, HP, Legend, and AST followed, respectively. In less than one year, the five market leaders in China converged to within one percentage point.

That IBM leads China with only 7.1% share indicates the lack of consolidation in the market. A list of multinational PC vendors with only trace shares of the PRC market combine for nearly 19% of shipments, and clone manufacturers — independent, simple-assembly screwdriver shops — take 44%.

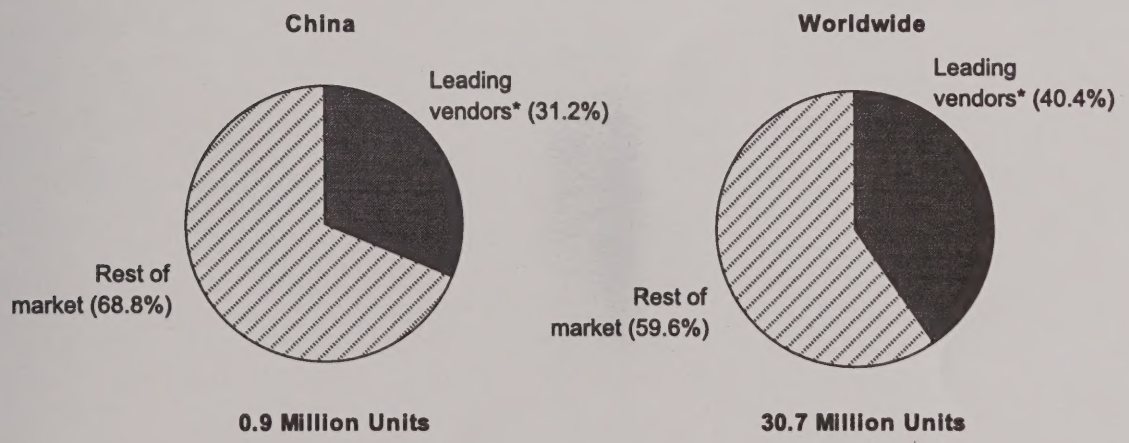
Desktops rule the shipment share in China (92%), leaving servers and notebooks only 3% to 4%

WORLDWIDE AND PRC PC SHIPMENT SHARE BY REGION, 1995 AND 2000



Source: International Data Corporation, 1996

LEADING MANUFACTURERS' COMBINED SHIPMENT SHARES, CHINA VS. WORLDWIDE, 1H96



* Leading vendors include Compaq, IBM, HP, AST, Digital, NEC, Acer, and Packard Bell.

Source: International Data Corporation, 1996

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each. Both lesser segments will achieve strong growth, however. Server shipments will nearly triple, to 125,113, and portable shipments will increase from 43,647 to 113,099 between 1995 and 1997.

TODAY'S KEY SEGMENTS: BUSINESS AND GOVERNMENT

Today's opportunities are in business and government. The business segment, anchored by the finance, manufacturing, and telecommunications industries, accounted for 67% of unit shipments in 1995. The finance sector is the strongest vertical market, but still underdeveloped.

Government, which took 9% of PC units shipped in 1995, is expected to exhibit strong growth as well. The Chinese government is planning technology imports of about $100 billion (U.S.) per year. The state priority is to improve infrastructure — including energy, transportation, and telecommunications — and the country may spend as much as $65 billion (U.S.) on energy and power-generating projects by 2000. Computer purchases will be an integral part of these improvements, and buyers are interested in what technology investments will do for them.

Government tends to purchase from outbound dealers and distributors; this channel probably will not change in the short term. Business, depending on the size of the purchase, will buy from any of the resellers. System integrators and value-added resellers will see growth selling to the business segment.

Tomorrow's Growth: The Home and Small/Medium-Sized Enterprise

The Home

In 1995, more than 200,000 PCs were shipped to homes in China. Halfway through 1996, almost 120,000 units had shipped, putting the market on pace for 19% year-over-year growth. The home segment is forecast to improve from 13% of the China PC market in 1995 to roughly 30% in 2000.

Of the 120,000 units shipped to homes in the first half of 1996, 87% were clones. As branded PCs come down in price, some clone manufacturers will disappear from the market, but this will take quite some time, for several reasons.

Price is the most important factor on which savvy Chinese PC consumers base their purchase decision. Vendors will have to further decrease the cost of their PCs to approach the average $920 price point of clone machines. Acer offers its AcerBasic machine for between $600 (U.S.) and $1,000 (U.S.), but its configuration doesn't match the offering of clones — and consumers know it.

Clone vendors have several distinct advantages in the margin wars. Clone manufacturers don't pay taxes or duty charges; they don't pay channel uplift charges, and in many cases they don't pay for the software they install on the machines. Also, local assemblers can sustain lower margins because of the lower GDP per capita in China. For example, a local assembler may realize a 4% margin on a $900 PC. If able to sell 100 PCs per year for a total profit of $3,600, the assembler has already exceeded the country's $540 GDP/capita by 6.6 times. While branded PC prices are decreasing, clone vendors will maintain a price/performance advantage that will ensure their viability.

The same low GDP per capita that lets clone manufacturers sell goods cheaply also breeds buying savvy among consumers. Because the cost of a PC is many times greater in China than in a country such as the United States when compared with respective average income levels, Chinese consumers pay strict attention to the features and performance value of the machines on the market. The average clone — configured with a Pentium 133, 16MB of RAM, 850MB hard drive, and a monitor — outperforms the name brands available and does so for less cost.

Customers recognize price/ performance benefits in leading vendors, as well as clones. Local favorite, Legend, sells more than 60% of its PCs below $1,500 (U.S.), which explains why it's at the top of the list of vendors selling to the consumer segment. The notable leading brands by midyear 1996 shipment share, in descending order of home sales, were Legend, IBM, Great Wall, AST, and Compaq.

Several factors are driving the home market. Consumers are enjoying increased disposable income stemming from the PRC's economic growth. Software is being developed in the local language, and the Internet is driving some sales. Software piracy, considered a scourge by much of the Western IT industry, actually pushes sales in China because it reduces one extra cost consumers would have to bear.

China's home PC market remains inhibited by the persistence of some direct opposites of the factors that drive its growth. Despite an increased disposable income, China's GDP per capita is still very low. Although local-language software is increasing and contributing to the market's growth, even more titles need to be developed. Vendors will need to overcome a general lack of awareness on the part of many consumers, and with an average of 30 people per phone in China, it is doubtful that a majority of the population is rushing to buy a PC to get online.

The retail channel accounted for only 4% of shipments in 1995, but for more than 15% of sales in the first half of 1996. It is a channel that will grow as the home market does.

Small and Medium-Sized Enterprises

Small office and small and medium-sized enterprises accounted for 70% of the business segment and 47% of the PC market as a whole in 1995. In 2000, small office and small and medium-sized enterprises will account for 66% of the business market and 31% of the overall market. These minor decreases in share are partly illustrative of the major gains in the home segment. Growth in the small and medium-sized enterprise segments comes at the expense of the large business segment, which drops 12 points, and the government and education segments, which remain relatively stable throughout the forecast period.

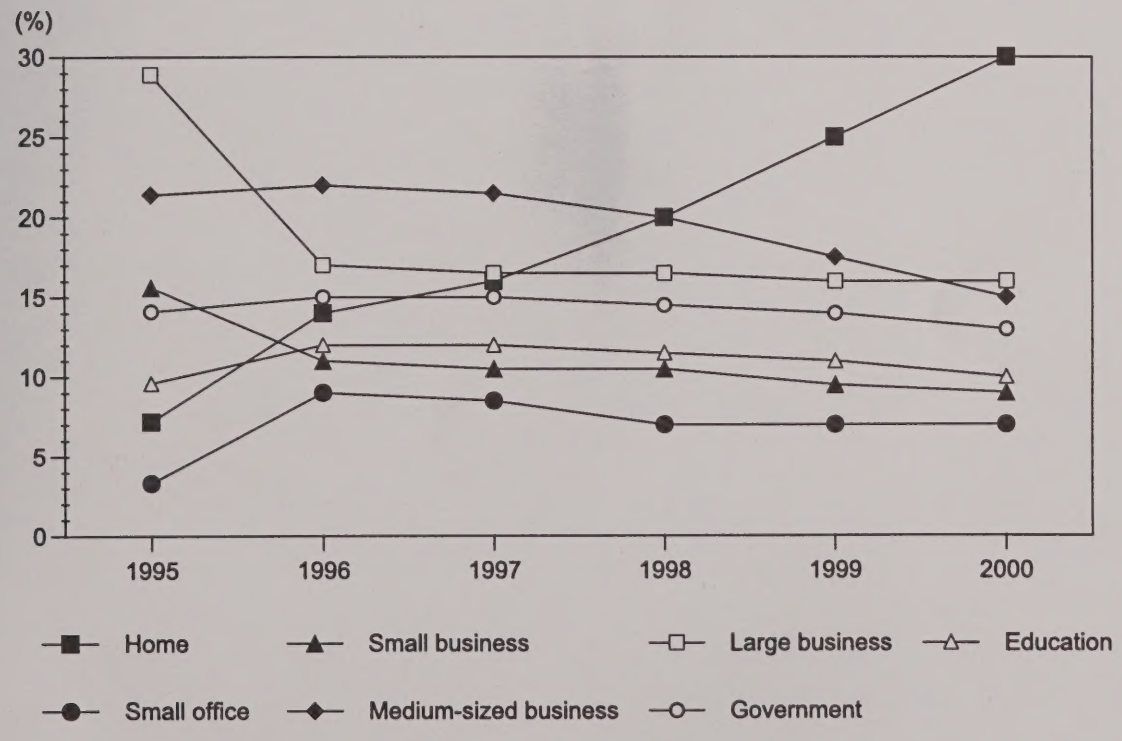
Low-priced PCs will accelerate penetration in small and medium-sized enterprises, and vendors should realize the importance of these models in their portfolios. Branded PCs offer high quality and solid service, two features clones can't. If vendors can offer models priced low enough, the reputation for quality and service may sway small and medium-sized enterprise customers away from the less-expensive, but riskier, clones.

Manufacturing in China

In an effort to avoid some of the high tariffs and import duties (see "China's Gray Market" box) in addition to helping develop channel and government relationships, and to establish reliable service centers, some vendors are establishing manufacturing facilities in mainland China.

However, at present, manufacturing in China does not solve the tariff and distribution problems as planned. In fact, most vendors producing PCs in the PRC lose money. The government levies a manufacturing tax on goods created there, and it still taxes components that must be imported to the manufacturing plants. Also, regulations stipulate that a percentage of goods produced in plants in China must be exported. Thus, vendors are taxed to make the goods, and in some cases they are taxed again when they export them — all to move product that could have been made more cheaply somewhere else.

PRC PC Shipment Forecast by End-User Segment, 1995–2000



Source: International Data Corporation, 1996

IBM is perhaps the most successful vendor with operations in the PRC, especially considering its partnership with major local manufacturer Great Wall. In 1995, IBM made approximately 100,000 PCs in China; 70% were branded IBM, and 30% were branded Great Wall. In 1996, IDC expects these numbers to increase to 200,000, 75% IBM and 25% Great Wall.

The IBM/Great Wall partnership works for several reasons. IBM and Great Wall provide a good mix of products; IBM enjoys a strong corporate base and is successfully moving units for more than $1,500 (U.S.) in 60% of its sales. Great Wall is reaching home users with a price per box below $1,500 (U.S.) 60% of the time. IBM gives strong brand name and product; Great Wall has government support. The relationship may be the reason IBM improved to be the No.1 vendor in 1H96 from No. 4 in 1995.

Compaq, AST, SNI, Unisys, Tulip, NEC, and Hewlett-Packard also manufacture in China. 1996 is NEC's first year in the PRC; through the first half it already had produced nearly 8,000 units,

CHINA'S GRAY MARKET: NOT A BLACK OR WHITE ISSUE

Vendors can fight China's gray-market channels or join them, but neither scenario is altogether efficient.

PC vendors importing assembled units and peripherals are faced with tariffs and value-added taxes that can total 30% or greater — an enormous markup in an industry reputed for small margins and a region in which consumers have much less disposable income than their Western counterparts. In many cases, these markups put PCs beyond the budgets of consumers and small enterprises … but the demand for the product remains.

Two sources of supply have stepped up to fill the need: (1) a bustling clone market of mom-and-pop assembly shops that piece together components and sell PCs under no-name brands and (2) a crooked but developed gray market with a definite presence in China.

The gray market, importing legal goods in less-than-legal fashion, can be navigated in several ways. Smuggling — the bringing of goods across borders with no record of import or payment of duties — makes up a small part of gray-market activity in China. A more frequent method for bringing goods in is through undercounting. In this practice, an importer with good contacts will underreport the number of units coming in and make sure the border guards and customs officials look the other way. Good importers or their colleagues will keep their ears open to warn retailers of pending inspections, thus allowing time for gray-market goods to disappear from store shelves.

Another method of alternative importing relies less on illegality and more on circumventing the PRC's red tape. In theory, all points of entry into China should levy the same duties, but in practice, no two customs bureaus are the same. Some areas independently lower tariffs to attract business, and sometimes the Chinese government agrees to lower tariffs to promote economic growth in depressed regions. Sharp importers stay abreast of regional port protocols, sometimes through added incentive for bureau officials.

Using gray-market delivery can reduce duties from 30–40% to 5–15%, but not without some moral and logistical headaches. Most distribution managers of multinationals know the gray-market practices are wrong, but sometimes companies' headquarters do not. And when a vendor releases goods through the gray market, it has no control over where they go or how. Goods may arrive damaged, and the types of outlets that sell them may ruin brand strategy. Offering service on gray-market PCs proves challenging, and vendors that do may undercut their legitimate distributors, who use service as a way to distinguish themselves from clones and gray-market goods.

Despite these ill effects, it's nearly impossible for honest vendors to challenge competitors, which trim 20 percentage points off their markups simply by finding one of the many alternate import routes. Experts agree, the thriving gray market is a symptom of the market's immaturity. Although it probably won't happen in the short term, the most effective way to dismantle the gray market will come from the central government.

and it plans to have manufactured 20,000 by yearend. HP expects 30% of its sales in China to come from manufacturing facilities there also before yearend 1996.

VENDOR SCORECARD

The PRC PC market will offer the same challenges as other PC markets around the world (increasing competition, rapid technology turnover, and low margins, for example) and some challenges of its own. Vendors that master worldwide challenges are not guaranteed success in China; they must address the market's unique issues (an established gray market, tough clone competition, substantial taxation). Profiled here are vendors with a presence in China and the strengths and weaknesses that will contribute to their degree of success.

IBM

IBM enjoys strong brand recognition and sales into corporate accounts. Its PC 100 brand is competitively priced in the home segment. IBM's 21 first-tier partners make for an aggressive channel strategy, and the vendor is reported to be investing up to $2 billion through the end of the decade in efforts to secure a large piece of market share. Through personal contacts and donations and goodwill gestures, IBM maintains good relationships with China's government; however, its most strategic alliance may be its partnership with Great Wall, as mentioned above.

IBM should monitor its channel strategy and avoid overexpansion. Although consumer demand is certainly strong, competition among channel partners may force prices down. IBM also could improve its service structures and its home penetration, but its relationship with Great Wall could cure the latter ill.

COMPAQ

Being the No.1 PC manufacturer in the world boosts Compaq's reputation in the PRC. It has a large installed base of PCs and a stable core of multinational end users. Compaq has an extensive channel network, and many of its partners boast their own nationwide sales structure. The company has a broad network of authorized service centers and maintains a local manufacturing presence.

Detracting from its success, Compaq has suffered credit problems stemming from trouble with its largest distributor, Cheflink (see box), and it is involved in serious gray-market activity as well. More than 80% of Compaq's units sell for more than $2,000 (U.S.), and consequently its home penetration is low.

HEWLETT-PACKARD

The PRC's third-largest computer vendor has some key strengths that may pay off down the road. HP operates dual manufacturing facilities for China, one in Shanghai and one in Singapore. It has a broad printer reseller network, which it is leveraging for PC sales. HP is aggressively pursuing partnerships with competitors' distributors and has established strong support networks, including hotlines, fax-back programs, and tech-support training. HP enjoys a good reputation for quality, and the company's world headquarters is making great efforts to boost market share in the PRC.

Chinese consumers perceive HP's PCs to be too high priced, despite that it sells a greater portion of its units in lesser price bands than does its rival, Compaq. Consequently, it has weak home-sector

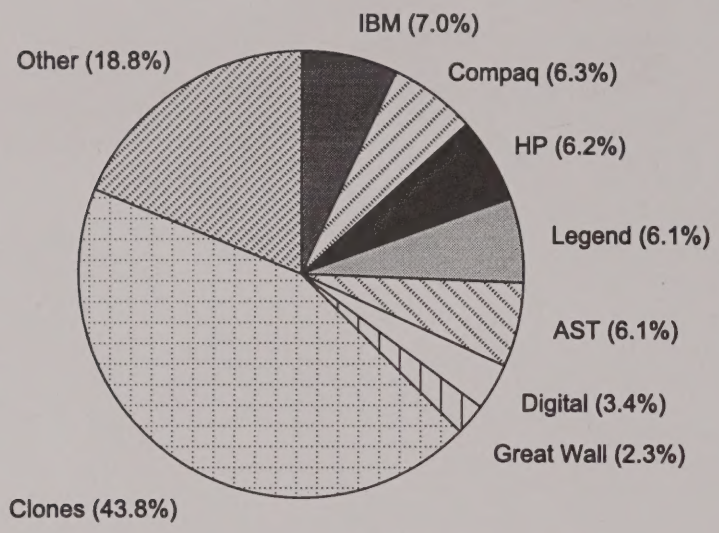
COMPAQ PUSHES CREDIT ENVELOPE

As vendors rush to capitalize on China's present market offerings and prepare for pending opportunities, they are making every effort to push product to market and snatch up share — even at the expense of profit. Compaq pushed these efforts too far and got burned.

In 1995, Compaq was enjoying strong relationships with loyal channel partners, who either pushed Compaq products exclusively or favored them above competitors'. But in third quarter 1995, Compaq shipped $32 million worth of product to its largest distributor, Cheflink, under very loose credit terms. When the vendor realized it wasn't seeing the repayment, it tightened its credit like a noose — on Cheflink and other Compaq channel partners. Needless to say, Compaq's relations with its channel have been adversely affected.

Resellers once loyal to Compaq have entered into partnerships with other vendors, and Compaq's performance in China has suffered. IBM signed on Cheflink and another former Compaq exclusive, Seastar; and perhaps not coincidentally, Big Blue assumed the shipment share lead through the first half of 1996.

PRC SHIPMENT SHARE BY VENDOR, 1H96



Source: International Data Corporation, 1996

VIETNAM IT MARKET TO EXCEED $1 BILLION (U.S.) BY YEAR 2000

IDC COMPLETES COMPREHENSIVE VIETNAM RESEARCH

China isn't the only Asian market poised to take off. IDC has just completed the first publicly available market research on the full information technology market in Vietnam. The total IT market in Vietnam in 1996 was $267 million (U.S.) and grew by 69% over the previous year. By 2000, the Vietnam IT market will reach and exceed the one-billion-dollar mark. The market demand pattern for IT is strongly tilted toward hardware. In 1996, the total hardware market in Vietnam was worth $218.6 million (U.S.), which represented a growth of 61% over the previous year. The report is available now. For details contact Lisa Bloom at 508-935-4236 or lbloom@idcresearch.com.

sales. Its co-op funding is generally inadequate.

LEGEND

Legend is recognized as the leading domestic brand in China by consumers. It has an aggressive pricing strategy and sold more than 20% of its units for less than $1,000 (U.S.) in 1H96 — by far more than any of the other leading vendors. It also sold more PCs for less than $1,500 (U.S.), but not by such a margin as its less-than-$1,000 (U.S.) sales. Legend has the bonuses of government support and a nationwide in-house distribution service. It worked closely with Microsoft to develop local versions of popular software.

Legend relies on others for technological innovation. It needs to expand its first-tier distribution system to include non-Legend partners. Legend's sales to multinationals and large and medium-sized organizations are weak.

GREAT WALL

Great Wall's great strength lies with its partner, IBM. Its governmental support through the MEI also is a strength as is its network of PC specialty shops that expand channels to the home user.

Great Wall's product innovation is weak, but IBM may change this situation. It also needs to develop channel support programs.

Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

The Information Highway's Madison Avenue Exit: A Necessary Stop for Search Vendors

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December 1, 1996
IDC #12807
Vol. 31, No. 18

Examining the state of the search vendor market is more than merely looking at the success of a group of software companies — it's looking at the present state of Internet advertising, a significant source of Web-generated revenue.

The close of 1996 sees leading vendors of Internet search services moving at the speed of mouse to combine top technology, savvy salesmanship, and prescient partnering in an effort to win the attention of the growing population of Web surfers and the advertisers who follow them.

In the period before the advent of widespread practical Internet commerce, business on the World Wide Web is grounded primarily in an advertising/media-based model. Internet search vendors that draw the masses draw the money. The good news for these vendors, which are mostly start-up companies, is that the size and scope of the Internet ensures a continued need for automated means of locating information. That's about where the good news ends.

The cost of entry into the search vendor fray — although increasing — is low, and superior technology does not guarantee success. Vendors must have the technology to index as much of the World Wide Web as they can while adding value for the end user where possible and, most important, selling their Web ubiquity to advertisers.

The influx of like-minded start-ups, none of which seem to be having trouble raising capital in 1996, is compounded by the possibility of the big browser players (i.e., Netscape and Microsoft) incorporating complex search capabilities in future versions of their product. Although how a Microsoft or Netscape would perform this incorporation is unclear, be it through a licensing agreement or the outright purchase of a leading search vendor, the ability to search intranets or the Internet from the browser would greatly inhibit the need for independent search sites and software.

THE GRAY SHEET

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If users need not leave their default page to search the Internet, the volumes of traffic the search vendors enjoy will dissipate proportionate with the search capabilities of the browser.

At present, however, Microsoft is stating that its only mission is to make its browser as easy to use as possible, so competition in the search vendor market is among the pure players in the immediate term. This issue of *The Gray Sheet* will review who the players are and examine their strategies; it also will examine the differences among them.

The following happenings typify the search vendor market through the close of 1996:

- Vendors are broadening their markets and providing localized content and features for regions outside the United States. In some cases these activities involve different language versions of their products; in others, they mean merely providing localized links back to the U.S. search engine.
- The worlds of search tool provider and content provider are colliding as companies partner to find means of filling holes in their strategies.
- The rush to roll out more advanced product continues.

SEARCH VENDOR BASICS

A seemingly universal least common denominator for firms in the Internet search market is a Web crawler tied to a database. Although specific implementations vary widely, under this scheme an automated search routine regularly scours the Internet for content, sending information about what it finds back to a centrally managed database. Companies then provide search forms on their Web sites, and these forms allow users to search the database for Internet content that matches the specified criteria.

In addition, many vendors (such as Yahoo!) categorize the information they've collected about data on the World Wide Web into a cross-referenced directory. By allowing users to sort through manually compiled lists of topically related Internet content, directories help free users of the burden of picking apt keywords to search on. As with approaches to search technology, firms vary widely on their technique for creating directories.

Although having a complete and up-to-date catalog of what is available on the Internet is important, search vendors must also be able to tame their massive databases, delivering to the user the most relevant matches.

On the search technology front, search vendors must balance depth and relevance. Although having a complete and up-to-date catalog of what is available on the Internet is important, they must also be able to tame their massive databases, delivering to the user the most relevant matches.

In light of the Internet's exponential growth, scalability is also an issue with which all search firms are grappling. What hardware and software platform is appropriate to crawl and index quickly such a rapidly growing and already massive environment? On the one hand, one could argue it

is, in fact, best to license search engine technology because it is changing quickly while simultaneously the Internet is growing dramatically. Why make a significant investment in technology that could soon become insufficient? On the other hand, the catalog and index are the crown jewels that ultimately provide users the value that draws them to search sites, in turn garnering advertiser interest. Why leave such an important function in the hands of others?

Search vendors are also under increasing pressure from ad agencies to bill by CPMs (cost per thousand impressions), provide third-party audits, and support "click-through" (as opposed to appearance) contracts.

The first two items are standard procedure in the "analog" world. CPMs are important if for no other reason than to help agencies harmonize with their budgets for print media. To provide the kinds of audits ad agencies are used to with other media, search firms will likely work with companies like I-Pro and/or NetCount. Finally, "click-through" contracts, which charge advertisers only when a user actually clicks on the ad (as opposed to every time it is displayed), may well become the norm simply because they are eminently possible with Web-based ads. At least initially, click-through deals will be negotiated on a case-by-case basis. (Much like the rates themselves, nobody pays "list" price.)

By tracking how visitors use a search site, including what terms they search for, search firms can offer advertisers impressive granularity in focusing their ads at desirable consumers.

Search firms provide advertisers more than just volume. By tracking how visitors use a search site, including what terms they search for, search firms can offer advertisers impressive granularity in focusing their ads at desirable consumers. For example, Ford could purchase not only general rotation ads on a search site, but ads that would show up in response to a user searching for "car" or "sport utility vehicle." In this sense, the Web offers businesses the ability to "narrowcast" their marketing and advertising messages as never before.

VENDOR PROFILES

DIGITAL — ALTAVISTA

Digital has taken a unique approach with its AltaVista search technology by partnering with Yahoo! to capitalize on the AltaVista engine's ability to generate advertising revenue. Thus, Digital can focus instead on more traditional software sales. More specifically, Digital has announced the Personal AltaVista, Workgroup AltaVista, and Enterprise AltaVista search products, which it will sell to end users and businesses. The Yahoo! deal, whose terms were not disclosed, allows Digital to profit from AltaVista's capacity to generate ad revenue without having to sell ads itself.

Personal AltaVista is a single-user, 32-bit Windows search/retrieval tool that helps users find local information relatively independently of file formats/types. For example, in addition to support for Microsoft Office documents, Personal AltaVista can search Notes databases, PostScript files, and cc:Mail messages.

Enterprise AltaVista, however, is a server application that crawls and indexes one's intranet as the original AltaVista does for the Internet. An Alpha Unix application (other Unix versions are planned), Enterprise AltaVista is HTML-only although a toolkit is available to index non-HTML data. Workgroup AltaVista is like the Enterprise version, but it is an entry-level intranet solution designed/scaled for a department as opposed to an entire enterprise, and it runs on Windows NT (both Intel and Alpha).

Not only is Digital's approach to capitalizing on its AltaVista search technology prudent (should Digital be selling advertising?), it's compelling. At the workgroup and enterprise levels, little else is available to corporations to help their employees find and navigate the ever-growing expanse of electronic information. Now that Internet technologies provide a platform for companies to connect this information, AltaVista provides a way for users to find and use it. At the desktop, Digital's challenge will be to provide significant utility beyond what Microsoft puts in the OS and what other vendors include in their applications.

On the search services side, Digital is establishing AltaVista Web sites in Northern Europe, Australia, and New Zealand in order to improve search time for users in these regions. Because AltaVista's database is a catalog of millions of Web

THE NAME GAME

Sticks and stones may break my bones, but names will never hurt me — or will they?

ATI Technology, a company in the business of making Web-site-creation software, has found itself in a suit with Digital Equipment Corporation. The debate stems from ATI's (full name: AltaVista Technology Inc.) use of the name AltaVista on its home page after it had made arrangements to license the rights to the trademark to Digital earlier this year.

ATI, a company that was incorporated a few years before Digital developed its famous search engine, allegedly broke licensing agreements by featuring links from its home page to Digital's search engine by using the name AltaVista standing alone and by replicating graphics and artwork used by Digital's search service.

Digital claims that ATI, which accepts advertising revenue for space on its home page, has made it possible for users to search the Internet using the Digital AltaVista search engine without ever visiting Digital's site. It is seeking a permanent injunction prohibiting ATI from using the AltaVista mark in any manner that creates the impression that ATI's site equates with Digital's. Digital is also seeking monetary damages.

At the writing of this newsletter, Digital announced an agreement with DoubleClick, Inc., to market display banners on selected AltaVista search pages. DoubleClick is a leading Internet advertising network.

pages rather than a directory, many international pages are already included in the U.S. version of the search service, but links from international sites to the U.S. AltaVista site caused many foreign users extended waits.

EXCITE

Excite's products include NetSearch, NetDirectory, City.Net, Personal Excite, and planned regional editions. The following is stated in its prospectus: "The company's objective is to establish itself as the leading branded media service for day-to-day interaction among consumers, content providers, and advertisers on the Web."

Like the other search firms, Excite hopes to maximize the use of its site — thus increasing the service's attractiveness to advertisers — not only through improving the user experience in various ways, but by increasing the number of points of entry to its site. To this end, it has formed agreements with important Internet access points (like Netscape, AOL, and MSN) to provide links to its site and for cobranded versions of the service and prepackaged query forms.

Excite creates some of its own editorial content, supports concept-based searching, and has plans for regional editions. The company employs 30 professional writers who write reviews of Web sites for its NetDirectory product (and will also contribute to Excite's planned regional products). Concept-based searching allows Excite users to find documents that are related to their queries, even if they don't contain the actual words used in a particular query. Finally, Excite's regional editions not only will provide users with a more tailored relationship with Excite, they will offer the firm's advertisers increased granularity.

Excite also has some unique technology that helps users understand and use the information that results from their search. For example, search result pages have a "query-by-example" button next to each "hit," which allows the user to do an additional search for documents statistically related to that particular document. Excite's automatic abstracting technology summarizes each document in its database by selecting sentences that are statistically likely to describe the document's contents. Perhaps most interesting of all, Excite's search facility is also capable of dynamic subject grouping so that search results are categorized for easier use. As a result, a search on the word "bonds," which could refer to financial instruments or chemical properties, would yield two separate lists.

For content providers, Excite offers (for free) Excite for Web Server (EWS), which provides Internet and intranet search capabilities while also allowing sites to automatically update their index information within Excite's Web index. To increase traffic at the Excite Web site, the

EWS package includes links back to Excite's page.

As with most search firms, Excite makes virtually all of its money from advertising that is sold both by a small direct sales force and an advertising sales agency. Current list pricing for Excite ads ranges from $25 to $50 per thousand impressions (CPM) — the higher fees for more targeted ads. The firm also offers "delivered value" pricing, under which advertisers are charged based on the value of business generated by the ad. More specifically, Excite's advertising programs include the following:

- General rotation. Ads rotate through high traffic Excite pages, including the main NetSearch, NetDirectory, and NetSearch result pages.
- City.Net and Regional Excite. These products allow advertisers to direct their ads at geographical groups.
- Keywords. They allow advertisers to target customers by associating ads with certain keywords or concepts. Thus, if a user were to do a search for "browser," the resulting page could contain an ad for Netscape.
- Personal Excite. Ads are delivered based on demographic information of Personal Excite subscribers.

Excite has distribution alliances with Netscape, America Online, Microsoft, and CompuServe and has media alliances with the *Los Angeles Times*, Tribune Media Services, International Data Group (IDG), and Reuters. As of March 1, 1996, Excite had 38 full-time employees: 14 in R&D; 12 in marketing, sales, and support; 7 in finance and administration; and 5 in operations.

HotBot

HotBot is a joint effort between HotWired Ventures (a Web content provider launched by the founders of *Wired* magazine) and Inktomi (a parallel-processing technology start-up out of Cal Berkeley). Although it is early to draw conclusions about this new contender, so far HotBot's differentiation is largely technical. By stringing together multiple workstations, HotBot claims to index every word on every page of the Net, or 50 million full-text documents (compared to AltaVista's 21 million).

Despite this technical prowess, one of the attractions of the HotBot partnership is that it is between a company that understands search technology, Inktomi, and one that can sell advertising, HotWired. When it comes to selling advertising targeted at an IT-savvy audience to companies with nontechnical products, HotWired (and *Wired*) have proven expertise (a nice foil to Yahoo!'s access to Ziff-Davis's sales force, which is heavily IT-focused). BellSouth contracted HotBot to provide a regionalized "guided tour" and search function for BellSouth.net, BellSouth's Internet access service.

Inktomi announced in October that HotBot will have another sibling. Inktomi signed a deal with Japanese telecom company Nippon Telephone and Telegraph (NTT). The deal proclaims that the partnership between NTT and Inktomi will build the largest commercial search engine for the Japanese Internet market. The Japanese search engine will join Anzwers, an Australia/New Zealand search engine also developed by Inktomi.

Infoseek

Infoseek's most compelling differentiation is its focus on content aggregation and integration. Not only has Infoseek entered into many partnerships (with companies like Hearst and IDG) to get access to content, but it integrates access to this content and its own resources for the end user. Consequently, user searches can result in a listing of hits as well as relevant links to Infoseek's directory in addition to appropriate editorial content from Infoseek partners. Ironically, Infoseek achieves this integration despite also licensing much of its technology.

The Infoseek search engine is based on technology from the Applied Computing Systems Institute of Massachusetts (ASCIOM), which is related to the University of Massachusetts. From HNC, Infoseek has licensed technology with which it intends to automate the creation and maintenance of its directory and abstracts. Finally, Infoseek has also licensed software technology from Xerox's XSoft division, which it will use to linguistically analyze search terms in order to provide more relevant search results.

In August, Infoseek released its Ultraseek search engine, which offers advances in three areas: currency of information, size of the database, and the way the database handles inquiries.

Another Infoseek innovation is its third-party-sponsored editorial Web pages called iZones. Companies that have sponsored iZones include BPI Communications, Condé Nast Publications, Hearst, the Reference Press, Inc. Online, IDG, SportsLine USA, and New Century Productions. As the Web matures and these partners establish their own Web successes, such partnerships may prove more difficult. Other Infoseek products include iSeek, an extension of the Infoseek Guide for the desktop, and Infoseek Professional, a subscription-based service that adds access to premium content.

Infoseek has an alliance with Verity, through which Verity will provide a link to the Infoseek guide from Verity's intranet-focused Topics Search Exchange product. To provide a localized Japanese service, Infoseek has partnered with Kanematsu, and the collaboration offers search services customized for the Japanese Internet. Infoseek also offers German, Spanish, and French translations of its U.S. database.

As of March 1996, Infoseek had 71 full-time employees, including 26 in R&D, 29 in sales and marketing (20 are dedicated sales reps), and 16 in finance and administration.

LYCOS

Lycos offers the Lycos Catalog, the a2z Directory, and Point Reviews (through its acquisition of Point Communications). The company helped to pioneer what is now a popular lineup of products for search vendors, including a spider that scours the Web for information and feeds the results into a database, a directory that attempts to categorize this database for easy navigation, and reviews that rate items in the database to help users find the highest quality information.

Lycos is one of several Internet companies under the CMG@Ventures umbrella, an investment and development partnership of CMGI (CMG Information Services, Inc.). The firm was founded to exploit the Lycos Internet search and indexing technology developed at Carnegie Mellon University, primarily by Dr. Michael L. Maudlin.

Like most search vendors, Lycos derives nearly all of its revenue from advertising. To this end, Lycos has a four-person direct salesforce and contracts with NetRep on a commission basis. Its standard ad rates range from $20,000 to $50,000 per million impressions. The vendor has also been resourceful and successful in licensing its products. For example, the firm licensed its catalog to Corel Corporation and Frontier Technologies for CD-ROMs and to Simon & Schuster for a book.

In October, Lycos announced a relationship with Telemedia GmbH to offer a localized German-language version of Lycos, and one with Prodigy Internet to offer Prodigy subscribers Lycos search technology within the Prodigy Internet service. Lycos also offers services in Sweden.

In December, Lycos probed the intranet market with a partnership with Inmagic. The two companies will coproduce corporate intranet spidering products that allow users to search for HTML and non-HTML documents and to view these documents in their native format.

An acknowledged challenge that Lycos faces (as do other vendors) is integrating its somewhat disparate product line. For example, Lycos intends to add relevant links to its a2z Directory and Point Reviews on its search results pages.

As of December 1996, Lycos had 86 employees.

HOW POPULAR ARE YOU?

Lycos's spider is unique in its use of "popularity" as a basis for searching Web pages. Through a proprietary algorithm that tracks the number of external links to each Web page, the Lycos spider explores the most popular pages on the Web; the more popular the pages are, the more frequently the Lycos spider checks for changes. As with several other vendors, the Lycos retrieval software attempts to determine the relevancy of search results. The Lycos approach is to use the position, frequency, and proximity of words.

As of February 1996, the Lycos catalog contained more than 25 million Web pages, an increase from roughly 4 million in June 1995.

McKinley — Magellan

The Magellan search site comes from the McKinley Group, a collection of publishers, technologists, and information specialists that was founded in 1993. Based on Verity's Topic Internet Server search engine, Magellan contains listings for 4 million sites, more than 45,000 of which are also reviewed. Magellan's most significant innovation is arguably its rating system, which includes greenlight icons to indicate Web sites that were free of adult-only material at the time of the review.

Magellan has licensing partnerships for links with many companies, including MSN, AT&T, IBM, Netcom, Pathfinder, Europe Online, and Quarterdeck. It also has partnered with the Creative Artists Agency (a literary and talent agency) to develop online communities — the first will be for kids — and with Europe Online to launch a European directory.

Yahoo!

Yahoo! arguably takes the least technical, most marketing-driven approach to the search tool market. Although its directory is admirable, Yahoo! doesn't own its search engine; instead, it has just announced it will license AltaVista from Digital. Today, Yahoo! uses technology from Open Text, and the search engine is relatively modest, with just 230,000 site listings that are limited to text only.

But given that Yahoo!'s success ultimately will be determined by its ability to sell advertising, these facts aren't necessarily a liability. After all, the search engine is important largely to the extent that it is able to attract users and sell advertising. It is both debatable and largely unproven that a more sophisticated search engine is necessarily more attractive to users and/or compelling to advertisers. Indeed, it is perhaps more important to both of these groups that Yahoo! was the first and really created the Internet search market ... its brand recognition is likely No. 1.

In addition to its flagship Web site, Yahoo! has introduced additional online properties along geographic, subject, and demographic lines, as well as offline/print products through alliances with Ziff-Davis (*Yahoo! Internet Life* magazine) and IDG Books (*Yahoo! Unplugged* and *Yahooligans!: A Web Guide for Kids*).

On the geographic front, in conjunction with principal shareholder Softbank, Yahoo! has launched a localized version of the Yahoo! Web site called Yahoo! Japan. In addition to a Japanese interface and Japanese language search capabilities, the site includes additional listings for Japanese Web sites. Yahoo! Canada, which first became available in mid-1996, is operated by Rogers MultiMedia (a subsidiary of Rogers Communications). In September, Yahoo! opened UK Yahoo!, and other European sites should follow soon. Yahoo! also plans a regional site for Australia.

Subject-oriented offerings include Yahoo! Computing and Yahoo! Marketplace. Launched in mid-1996, Yahoo! Computing is operated by Ziff-Davis and includes a computing-focused directory and editorial content. Yahoo! Marketplace, a Web navigational service focused on consumer products and services, is the anticipated result of an agreement with VISA. The firms expect to create a new company 55% held by Yahoo!, 45% by VISA.

Yahooligans is Yahoo!'s first demographically focused Web offering and is a collaborative effort with Ingenius (a private company affiliated with Reuters New Media and TCI). This version of Yahoo! is intended for children ages 8 to 14 and includes more than 1,500 Web listings selected by educators as appropriate for children. Other demographic focus areas Yahoo! has identified for potential future products include retirement, family, and college students.

To further enhance and personalize its users' Internet experiences, Yahoo! recently struck a deal with Agents, creators of the Firefly entertainment site (*http://www.ffly.com*), to use that firm's impressive intelligent agent technology.

For sales, Yahoo! primarily relies upon Interactive Marketing Inc. (IMI), which specializes in the consumer goods and services industries. In addition, Ziff-Davis is Yahoo!'s exclusive worldwide sales agent for accounts in the computing industry. Both firms are compensated based on a percentage of the advertising revenue they generate.

As of March, Yahoo! had 49 full-time employees, including 19 "surfers," who classify and organize Yahoo! listings, 13 in sales and marketing, 10 in

research and product development, and 7 in administration and finance.

CONCLUSIONS

As is usually the case for IT companies (if not all businesses), search firms are faced with significant technical and sales challenges. On the technical front, search vendors are clamoring to effectively crawl and catalog the ever-expanding Internet in a way that provides maximum utility to users. Not only does this effort require a sophisticated and scalable architecture, it also requires an intelligent one that provides relevance and personalization. From a brute-force perspective, HotBot's parallel processing technology (via Inktomi) is a good idea. A single system will likely prove unwieldy for quickly and effectively scouring the Internet; a parallel-processing or cluster-computing approach is probably more cost-effective (in fact, Internet search could prove to be a killer app for this technology).

A great search platform, however, is at best a user magnet. For search firms to ultimately generate profits, they must sell advertising. Sales and marketing prowess is equally important to success, and thus a critical core competency. Even more so than technology, sales capability cannot be created overnight; hence, the many media executives at high places in search firms, the partnerships with content providers, and the contracts with ad sales outfits.

There is no single solution to either of these challenges. In fact, compressed Internet time frames have expanded the basic approaches beyond just "buy versus build" to "buy versus build versus partner." (Indeed, to achieve reasonable time to market in the Internet era, the partner approach is perhaps more attractive than ever.) Ultimately, though, the technical barriers to entry are relatively low. Creative marketing and salesmanship are what will differentiate successful search firms.

SEARCH FIRMS' SUCCESS AS INTERNET BAROMETER

The extent to which search firms are successful should prove an interesting measure of the Internet's development as a business medium. So far, advertisements are the means by which most money is being made on the Internet. However, if Internet commerce takes off over the next year or two, by definition the Internet will be an effective place to do business, and search firms should do well — but products don't have to be sold over the Internet for advertising to be compelling. Should real Internet commerce prove disappointing over the coming months and years, advertising revenue and the performance of search vendors may be a good proxy for measuring the Internet's maturation as a new business platform.

Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

Visions of Multimedia and the Internet Awaken Japan's PC Market

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One of the fastest-growing PC markets is not in a third-world nation; it's in the nation with the world's second-largest economy: Japan.

In the late 1980s, while the United States and other nations began developing client/server technology, Japan was pursuing a bigger-is-better concept. Japanese businesses invested in large, proprietary information management systems and large employee classes. Markets for personal computing were left largely untapped.

Productivity gains in the business sector, created by group computing and e-mail, and a new perception of ease of use in the home sector, created by Windows 95 and the proliferation of CD-ROM software, are fueling a widespread demand for PCs similar to the demand that began in the United States a few years ago.

Japan has a tendency toward technology adoption and the financial resources to spend generously on PCs. It accounted for 17.5% of the world's $23.9 trillion GDP in 1995. However, Japan's share of the 1995 world PC market was only 10%. In comparison, the United States, which held 26.1% of the world GDP, accounted for 40% of the world PC market.

Although in most markets it is unlikely that a country's worldwide share will diverge dramatically from its GDP share, the PC market demonstrates a distinct case of imbalance. This is a very clear indication of the extent to which the Japanese PC market has diverged in appearance from other country markets, and Japan's deficit indicates its readiness for growth.

This issue of *The Gray Sheet* will focus on the state of Japan's PC market in 1996 and opportunities for PC vendors in 1997:

- A combination of factors ignited Japan's PC market. The release of Windows 95, in November 1995, along with the public's growing love affair with multimedia and the Internet, prompted

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unprecedented purchasing in the home segment.

- Fujitsu's aggressive pricing at the beginning of 1996 also spurred Japan's PC growth. However, throughout 1996, after the initial "Fujitsu Shock," unit prices steadily increased as vendors began offering more advanced features and consumers showed a willingness to pay for them.
- In 1997, decreasing screen costs will drive sales of portables, and multimedia products will continue to be popular in the home segment and in some businesses.
- During the second week of 1997, Toshiba and IBM released products based on Intel's MMX chip. This advanced multimedia chip will create demand because of its capabilities and because it will force down prices on older chips.

Japan's PC market shows paradoxical characteristics. It will enjoy tremendous growth, rivaling that of nations like China, but it will not experience the chaos that accompanies undeveloped markets. In 1997, some vendors will see triple-digit growth; some vendors will tap new segments of the market; one start-up vendor may even rise to prominence. However, Japan is a mature nation with mature markets and channels, and successful vendors will spend more time developing their fundamentals (brand awareness, quality support, and strong channel partnerships) than on battling new-market headaches (gray markets, corrupt customs officials, and high tariffs).

JAPAN'S MARKET SIZE IN PERSPECTIVE

Japan's average annual growth rate is forecasted to be nearly 19% through 2000, outpacing by five points the worldwide growth rate for PCs for the same period. Japan's share in the world market will increase from 10% in 1995 to 14% at the turn of the century. In units, this is an increase from 5.8 million to 16.7 million shipped.

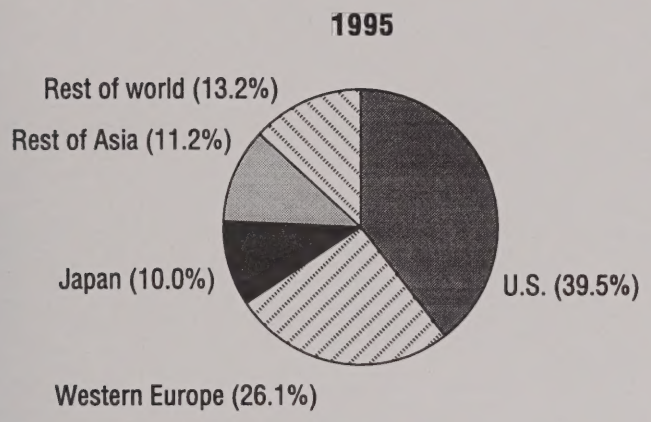
Japan's growth from 1995 to 1996 is estimated at 44%. It is the largest year-on-year growth rate of the major regions tracked by IDC in 1996 (United States, Western Europe, Japan, Rest of Asia, and Rest of World) and the largest of any major country. In 1H96, 3.9 million units had shipped; 8.4 million are expected to have shipped by yearend.

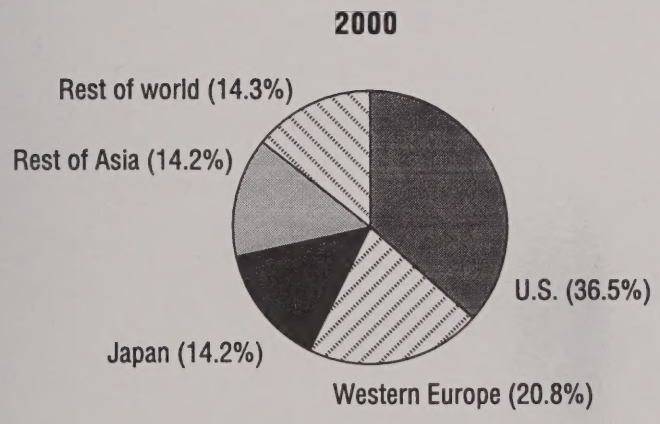
WHICH SEGMENTS WILL SEE GROWTH?

In 1995, Japan's home segment tied with medium-sized business as the leading application segment for PC sales; each accounted for 33% of units shipped. Large business took 17.5% of shipments. When compared with the United States, Japan's distribution among segments is notable for several reasons.

In the United States, 39% of PCs shipped went to homes. This percentage is six points more than Japan's home shipments, but not a big advantage considering the latency of Japan's market. A greater difference is evident between Japan's medium-sized and large business shipments (combining for 50% of the market) and the U.S. medium-sized and large

WORLDWIDE PC SHIPMENTS BY REGION, 1995 AND 2000





Source: International Data Corporation, 1996

business segments (combining for only 27% of the market).

Japan's strength in shipping to medium-sized and large businesses may say more about the segments that vendors in Japan are *not* shipping to. Only 1.5% of PC shipments went to government, and 0.7% of shipments went to small offices in 1995. In the United States, government and small office segments received 6% and 12% of shipments, respectively.

IDC Japan believes that there is still large untapped potential in Japanese households. In 1995, household PC penetration stood at less than 10%; by comparison, the rate in the United States was more than 35%, according to IDC/LINK. By 2000, IDC Japan expects home penetration to exceed 44%, with more than 18 million PCs in use.

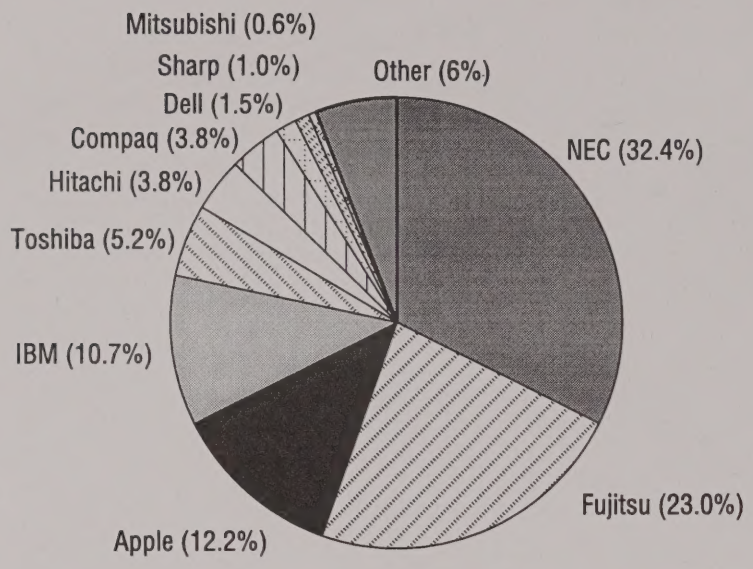
The growing popularity of multimedia and the Internet, and increasing competition, will help drive sales in the home segment. Japanese buyers are willing to spend more money on their PC purchases in return for better features. The bargain-based PC market has not developed yet in Japan.

Japanese consumers also foster the notion that PCs are growing easier to use. One vendor that is suffering in other markets, Apple, is capitalizing on its user-friendly reputation and is enjoying success in Japan.

JAPAN'S PC MARKET PLAYERS

In the past, Japan has proven to be a hard market to crack for foreign vendors, not only because of its prior lack of interest in PCs as an IT tool, but because of buyers' fierce loyalty to Japanese-made products. Although Japan has removed the majority of official trade barriers (import licenses are granted on a pro forma basis), and tariffs are low (2.9%), foreign vendors still have difficulties. Imports are not transparent in the Japanese market, which fosters local loyalty in the purchasing process, and import approval procedures are hampered by red tape. The cost of land for setting up shop in Japan is high, and the distribution system is still somewhat fragmented.

JAPAN PC SHIPMENTS, 1H96



Total shipments = 3.9 million

Source: International Data Corporation, 1996

Nonetheless, outside vendors are gradually improving their positions as competition heats up, and local vendors are battling among themselves to achieve dominance. Following are descriptions of the major players in Japan and their strategies.

NEC

NEC until recently enjoyed the lion's share of the Japanese PC market. However, with the market's phenomenal recent growth, the company has been forced to share the wealth with other players. As the market has taken off, what were formerly its small areas (ones not necessarily dominated by NEC) are now enjoying the greatest growth. For example, Japan's large-business-segment information systems, formerly dominated by mainframes, shifted to the distributed computing environment and such systems as client/server.

Two main factors have made NEC successful. First is the strength of its PC-98 brand, and second is the scale of its distribution channels. The brand value of the PC-98 series is particularly important. It has been 15 years since NEC released its first PC-98 personal computer, and this legacy cannot be underestimated. NEC's market presence because of brand strength is not something that competitors can easily overcome. The most important consideration for a PC vendor is brand strength. As personal computers approach commodity status, the latest technology becomes obsolete in six months, and revolutionary channel strategies become common within a few years.

NEC shipped 1.3 million computers in 1H96 in the Japanese market, good enough for first place by a wide margin, but the key to its long-term success will be how effectively it can optimize its partnership with Packard Bell to build a global strategy. Though the deal is signed in ink, whether or not the two companies can effectively combine their operations is another story.

FUJITSU

The No. 2 shareholder, Fujitsu shipped almost 900,000 PCs in 1H96, not far from its 1 million total shipments for 1995. This increase gained Fujitsu seven points in market share, apparently at the expense of NEC.

Fujitsu changed strategic gears and initiated its bold pricing strategy in the Japanese market just as CD-ROM electronic publications, shipment of Windows 95, and the growth of the Internet began to accelerate. The timing was perfect because it happened right at the start of a record-breaking boom in the consumer PC market in Japan. The move was simple, yet yielded dramatic results, as is evident in Fujitsu's jump in market share.

This pricing strategy caused reverberations in the entire market. Other competing vendors have been forced to drop their prices as well to remain competitive, and the unnaturally high sales prices of PCs in Japan have started to come down. Fujitsu paired its pricing attack with a marketing campaign

associating PCs with things familiar to and popular with consumers — a television commercial starring popular Japanese comedian Toshio Sakata, for example. In addition, client/server system adoption rates jumped among Fujitsu's traditional base of mainframe and office computer users in the business sector, creating a larger market for its business PC clients.

Obviously, a price war cannot continue if vendors are to be profitable. Some in the industry say that Japanese PC manufacturers have been able to finance price war strategy by investing massive profits from expansive semiconductor operations in their PC businesses. However, now that the semiconductor industry is slowing down, it will be difficult for this sort of investment to continue. Fujitsu, possibly as a result of these new market conditions, has also indicated that it does not wish to continue its cut-rate pricing strategy.

Is this merely a short-term grab for market share? It cannot be denied that Fujitsu's consumer desktops are showing no profits. But profits in the business machines division cannot be ruled out completely. In this market there are cases of companies that have purchased 2,000 to 3,000 clients for their computer systems. These systems are now forced to handle many times the previous amount of data, and they likely will suffer from information overflow. Subsequently a new market willl evolve for new mainframes and servers as well. Though few companies are scrapping old systems altogether and investing in completely new PC client-based systems, a goodly number are acquiring PCs along with the purchase of mainframes, office computers, networking peripherals, hardware, software, and maintenance. Fujitsu's PC division may be in the red, but the market surrounding PCs is proving to be very profitable to the company as a whole. This situation is the real secret to Fujitsu's ability to continue its price war.

Apple Computer

Apple traditionally has carried a strong brand image in the consumer market in Japan. That image can be described as polished (no pun intended), easy-to-use, and simple. By building on this image Apple has captured a significant portion of the market and claimed third place. It shipped close to 500,000 PCs in 1H96, on pace to finish stronger than its 835,000 total in 1995. However, the company did slip in market share in 1H96, garnering 12.2% instead of the 14.3% it held at yearend 1995.

The main reason for Apple's popularity in the consumer market is its robust Japanese word processing functionality. The dedicated word processor market in Japan has been firmly established for some time. However, many of these customers are moving to PC platforms. Of the total Japanese word processor market, 70% to 80% is considered consumer based, and this segment is the one in which Apple is succeeding.

Though Japan has been a successful market for Apple, it was impossible for the company to avoid the many problems it has been facing in other areas of the world. Apple's difficulties in the Japanese market in 1995 stemmed from trouble with its portable lines and lack of a distinct Internet-associated image. Apple was also hurt by an inability to meet demand for its portable machines and the long delayed release of its PowerPC-installed machines.

Apple may have severely dropped the ball regarding the Internet as well. Though the PC maker has always produced exceptionally "Internet-friendly" machines, it failed to adequately reinforce this image with consumers at a time when the Internet boom has been a prominent factor accelerating PC sales. Apple's Internet image problem continued into early 1996, but since then it has managed to rally and improve this deficit and to release a new notebook line, due to be shipped in 1Q97.

IBM Japan

IBM has made its mark in the Japanese consumer PC market. It shipped 417,000 units in 1H96, earned nearly 11% share, and narrowed the gap on the leading foreign vendor (Apple). IBM should continue to improve through 1997; it released products based on Intel's MMX chip at the beginning of the year.

IBM's Aptiva models have been very well received by Japanese consumers. This success has been due to solid partnerships in home electronics channels. In particular the company has succeeded with Aptiva by carving a market niche for tower form-factor machines. Aptiva has come to symbolize

the tower for Japanese consumers. In fact, in the home electronics channel at the start of 1996, sales competition was defined by the IBM Aptiva tower and the Fujitsu Deskpower all-in-one images.

According to an IDC Japan sales channel and pricing survey, IBM's prices are considerably higher than those of other vendors. By looking at the specs, one can see that IBM's PCs are filled with high-powered functionality, but the real reason for the higher prices is IBM's wish to develop a brand image of high quality. Another marketing coup for IBM was its success in equating its PCs with Internet readiness just as the Internet market began to boom.

However, in the business market IBM has not been so successful. Particularly in the PC server market, it is lagging behind leaders Compaq, NEC, and Fujitsu. Nonetheless, IBM Japan's growth potential is great in this segment because its base of mainframe users, sales channels, and system engineering is strong.

Toshiba

The fifth-place PC vendor in Japan through 1H96 was Toshiba. Like Fujitsu, Toshiba had nearly matched its 1995 shipment total with its 201,000 units through 1H96. Like IBM, it released products based on MMX technology at the beginning of 1997. Thus, Toshiba is in position to increase its margins in the short term.

Toshiba has perennially dominated the portable market in Japan, but in 1995 it also reentered the desktop and PC server markets with machines OEMed from Intel. In November 1995 Toshiba introduced a consumer desktop line, Brezza, just in time to take advantage of the end-of-year bonus period buying flurry. However, this year Toshiba has shifted its desktop strategy. It has ended its OEM agreement with Intel in Japan and is now manufacturing its own desktops under the Infinia brand name in the United States and the Brezza brand name in Japan.

Toshiba made a splash in the market earlier this year with the release of a unique product, the world's smallest Windows-based subnotebook, called the Libretto. It has been so well received in Japan that now Toshiba is suffering from an inability to keep up with demand. It is a model that can cross segments: Libretto will sell to end users considering portables, and it will sell in the general consumer market.

In 1996, Toshiba began aligning all of its products under worldwide brand names. The portables have been unified under the Dynabook name; that is, the word "Dynabook" has been attached to all overseas brands as well. And so Toshiba's Tecra notebook has become Dynabook Tecra, and so on. It is likely that Toshiba has made this move to cement in consumer minds one strong brand name in portables.

Enter Akia

One of the most exciting vendors to watch in Japan's PC market will be upstart Akia. Created by former Dell Japan president Katsumi Iizuka, Akia is trying to carve a niche by selling competitively priced high-end PCs. It's a mission that should be well suited to the market demands in Japan.

Akia's first release was a Pentium 100MHz notebook, which debuted in February 1996. Newer models, called the Tornado series, come loaded with 12.1-inch screens, 133MHz and 150MHz Pentium processors, two or three PC Card slots, CD-ROMs, and video capability. The average price is about $4,000.

Akia also released desktop machines under the Microbook name. The Microbooks debuted in July 1996, and recent models have 200MHz processors, 12- to 14-inch flat screens, 2GB hard disks, and 8x CD-ROMs. The average price for these machines, like the notebooks, is about $4,000.

Akia is selling as a direct vendor and is developing some retail channels. By following a development strategy that enables it to change gears swiftly, combined with OEMing parts and delegating manufacturing to various companies, this vendor has pioneered a new method of cost control. To establish favorable brand recognition swiftly, Akia announced a new marketing company at the same time it announced its own.

HITACHI

Hitachi moved up a notch in the shipment share battle, taking the sixth-place spot from Compaq by the end of 1H96. Hitachi's 149,000 units edged out Compaq by 3,000 and set the company up for potential triple-digit growth for 1996. Hitachi has been most successful in the business market in Japan.

In 1996 and beyond, the Hitachi Group is expected to continue its success in client/server systems through the possessive use of its own group as a market. The Hitachi Group has a very large mainframe and office computer user base. Hitachi Corporation alone has 360,000 employees. The following example is extreme, but if one-half of these employees are using a PC, this number is equivalent to Hitachi's total PC shipments for 1995. Hitachi also has strong brand recognition for its office computers and mainframes in the large business sector. From this standpoint, if Hitachi can successfully sell its client PCs within its own group, then it can easily approach the magnitude of NEC's, Fujitsu's, Compaq's, and IBM's presence.

In the consumer market, Hitachi has leveraged its home electronics channels and increased its retail channels in order to sell its consumer-oriented Flora series. These channels were originally Hitachi home electronics channels through which the company had been successful selling Japanese word processors. Slowly but surely it is expanding its total PC shipments. It also scored big points with consumers by landing Japan's most famous baseball manager, the Yomiuri Giants' Nagashima Shigeo, to be its point man in television commercials and other advertisements.

COMPAQ

Compaq's performance is a good barometer to measure the competitiveness of Japan's PC market. It sold nearly 150,000 units through 1H96 — a pace much better than in 1995, when it sold 216,000 units by yearend — but it dropped from sixth-place vendor to seventh place.

Compaq made a big splash into the market when it instigated a price war, known as "Compaq Shock," in the business market in 1994. In 1995, however, it was the consumer market that took off, but Compaq was still busy solidifying its business-segment strategies. Undoubtedly, Compaq has a very strong presence in the rapidly expanding PC server market, and to this degree its strategy can be considered a success. Nevertheless, the vendor lost an opportunity by not focusing more on the consumer market in 1995.

Through TV commercials, Compaq has expanded its brand image in Japan. Compaq needs to release some entry-level models that can compete with Fujitsu's Deskpower series. However, as the world's top vendor, Compaq is limited in strategic options because of a need to focus first on global profits. How Compaq will handle this situation remains to be seen.

In 1995 Compaq consolidated many of its business channel partnerships from about 100 to 30 of its most profitable partners, but to achieve its goal of expanding in the large business market, this consolidation has not been enough. Compaq must decide whether to make its own direct sales division or link up with a large keiretsu (a tightly formed business alliance) that has strong channels able to market its computers positively. A keiretsu is a group of businesses closely associated through shareholdings and business partnerships. Many keiretsu include one large bank that assists the group by offering loans with low interest rates.

DELL COMPUTER

The vendor making the biggest jump in the Japanese market right now is Dell Computer. Like Hitachi, Dell may realize triple-digit growth for 1996. It shipped 58,000 units in 1H96, compared with 60,000 for 1995's total.

In Japan, Dell's success can be attributed largely to its direct-response marketing model. This inbound sales technique seems to be suited to the business market in Japan. When it first entered the Japanese market, Dell toyed with other sales channels such as home electronics shops, but now it is focusing only on direct sales. Once a business purchases Dell's machines, the vendor aggressively pushes for repeat sales, especially in the large business sector. Currently, Dell is rapidly expanding its clientele by offering low prices and adding on effective support and maintenance programs.

Other Promising Vendors

Other vendors to watch include Nihon Hewlett-Packard, PB-NEC, Gateway 2000, Sharp, and Akia.

Nihon HP has entered the server market in Japan. Originally, the company was strong in areas like Unix servers and workstations, but it may begin to make the shift from Unix to Windows NT-based products. Also, IDC Japan expects this vendor to strengthen its PC business by offering stronger service and support for the business market. Nihon HP may enter the consumer PC market in Japan by leveraging its strong printer channels.

PB-NEC started doing business in Japan in October 1996. It is likely that the vendor will expand its sales channels to include some of NEC's channels in the first half of 1997. In addition, NEC's mainframe user base will probably provide PB-NEC with a client market for its DOS/V machines.

Gateway 2000 is another vendor to watch. It entered the market through direct mail order, but lately it has switched gears and is emulating Dell Computer's direct-response model. Gateway has also pursued a channel partnership with Nissho Iwai, a large trading company with an electronics distribution arm. With this partnership the company won't be left out in the cold when it comes to competing in the business sector.

In the portable arena, Sharp will be a vendor to watch. It is producing low-priced, high-performance notebooks in increasing numbers, heating up competition in the portable market. Sharp, able to lower production costs by installing its own LCD screens in its notebooks, holds a dominant position.

IDC Japan to Release New PC Report

IDC Japan will release a Japanese PC market report in January. This report gives the most thorough overview of the Japanese PC market to date. Based on extensive model-level data on the Japanese PC market tracked by IDC Japan, the report provides insight into the meteoric growth of the market in the past 18 months and how vendors can successfully be a part of the boom now and in the future. Included is a market forecast through 2005 as well as forecasts with CPU, segment, and form-factor trends. Successful vendor strategies are analyzed in addition to what vendors are doing now to succeed in Japan in the future. For more information, contact Kazuki Seki at IDC Japan, seki@idg.co.jp or at 011-81-3-5467-4301, or contact Lisa Bloom at IDC Framingham, (508) 935-4236 or lbloom@idcresearch.com.

Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

Change in the IT Industry: A Pictorial History, Part I

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December 30, 1996
IDC #12885
Vol. 31, No. 20

How much will the worldwide market for IT products grow? What technology has seen the greatest increase in performance capability? What regions are gaining a bigger share of the IT pie?

As the leader in the IT market research field, IDC tracks segments of the IT industry on a day-to-day basis. Having done so for more than 30 years, we've acquired a wealth of historical data about a marketplace in which only change is constant. From time to time our clients ask for a long-term view of the changes that have shaped the IT industry and, consequently, shaped the way people do business in the latter half of the 20th century.

The two *Pictorial History* issues of *The Gray Sheet* trace the technologies and trends that have shown notable growth or influence during the past four decades. Part I focuses on changes in technology:

- Can the modem market continue its strong growth?
- What did a megabyte of memory cost five years ago? What will it cost in 2001?
- How many PCs will be connected to a LAN at the turn of the century?

These and other technology-related questions are examined in this edition of *The Gray Sheet*. The second issue in this series will focus on regional trends and end-user issues.

The concentration of such historical data can provide more than a lesson in the industry's past. This data provides comparative background for reports, presentations, and marketing materials. It offers a measure of what technologies succeeded and provides a benchmark for technologies of the future.

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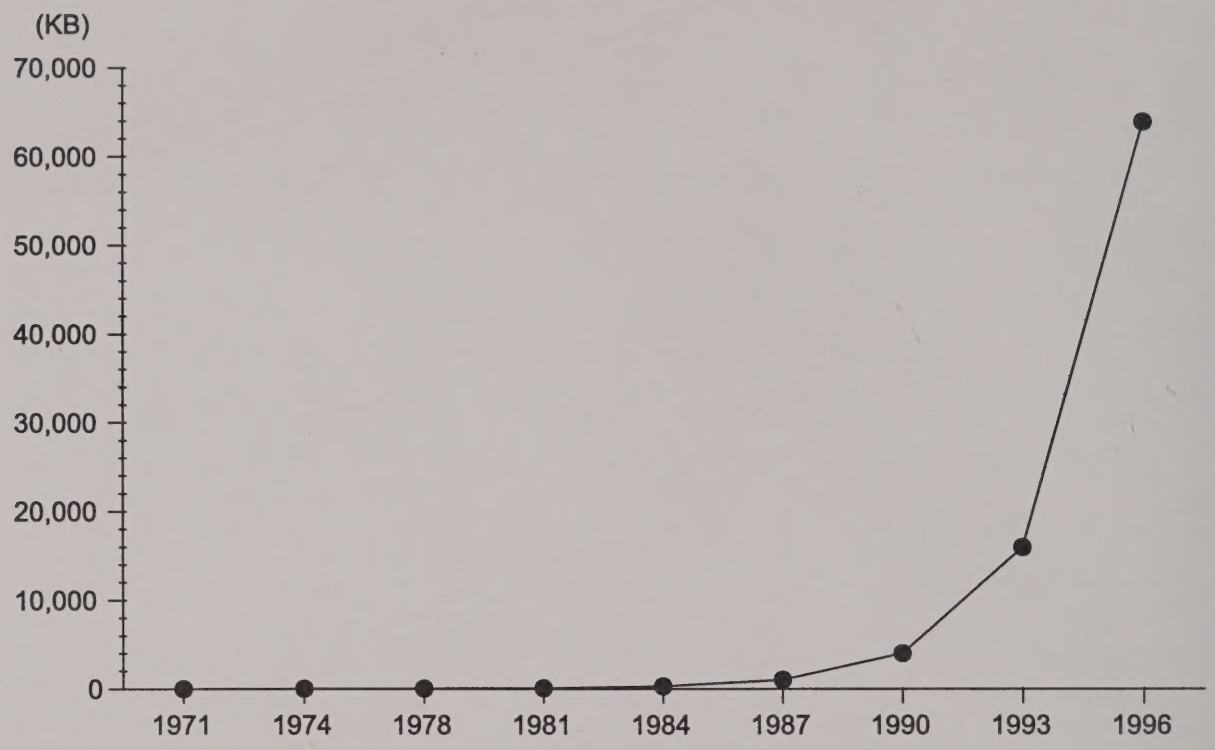
DRAM Chip Capacity, 1971–1996 (KB)



Source: International Data Corporation, 1996

DRAM capacity is a direct function of transistor density. It has grown faster than any other technology.

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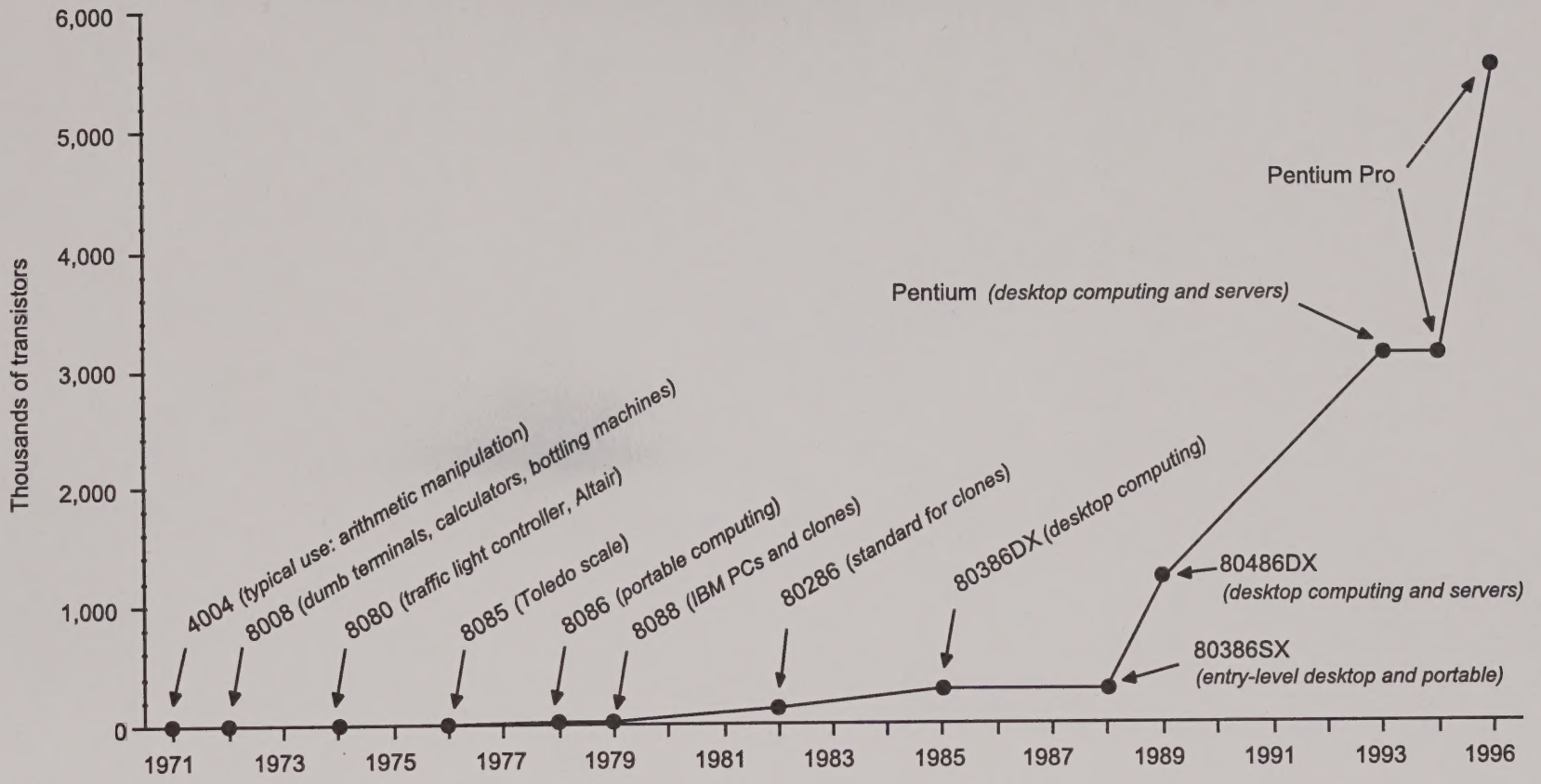
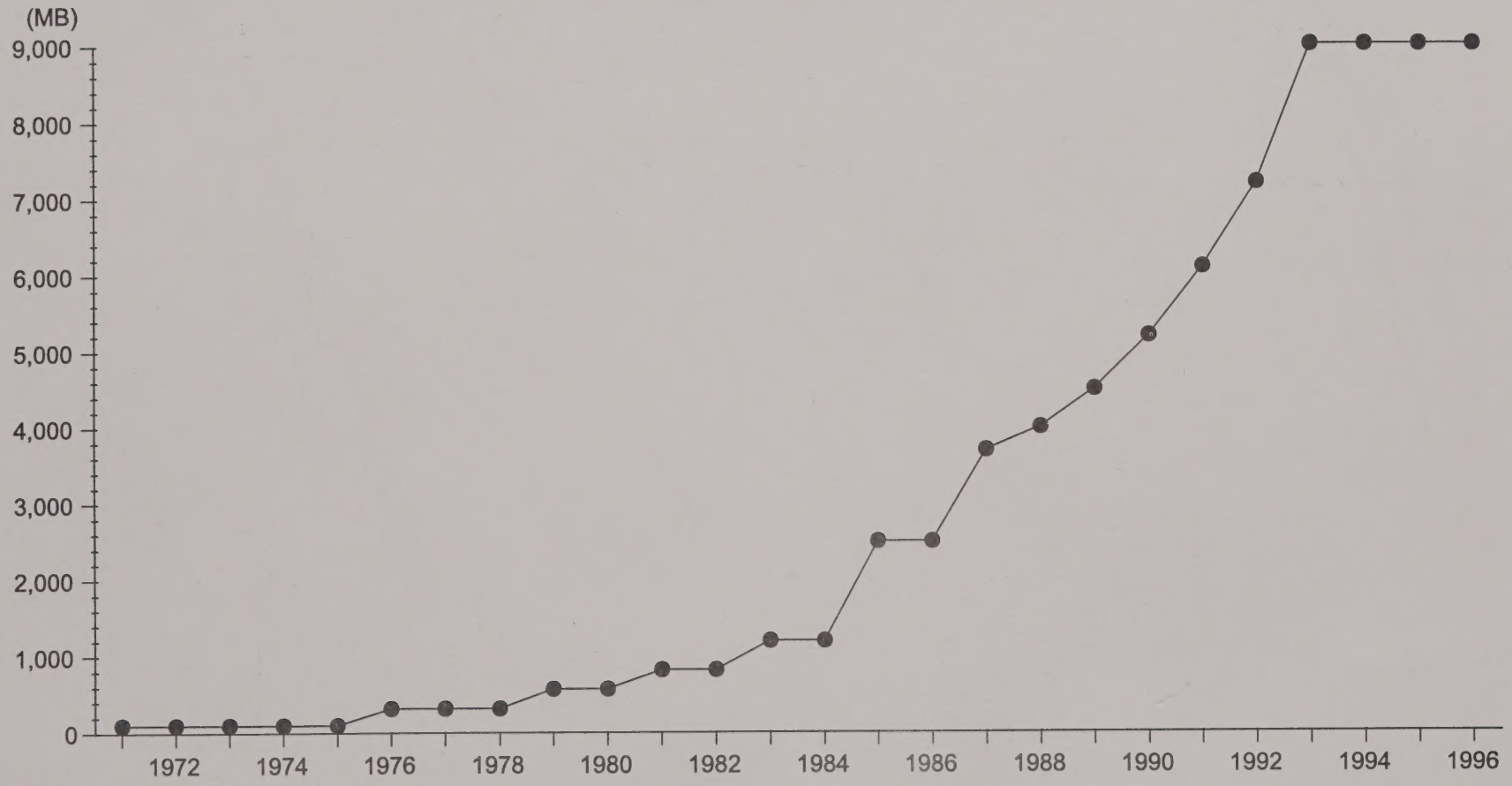
Transistor Chip Density on Intel Microprocessors, 1971–1996



Source: International Data Corporation, 1996

Intel's processors increase in speed as transistor density increases.

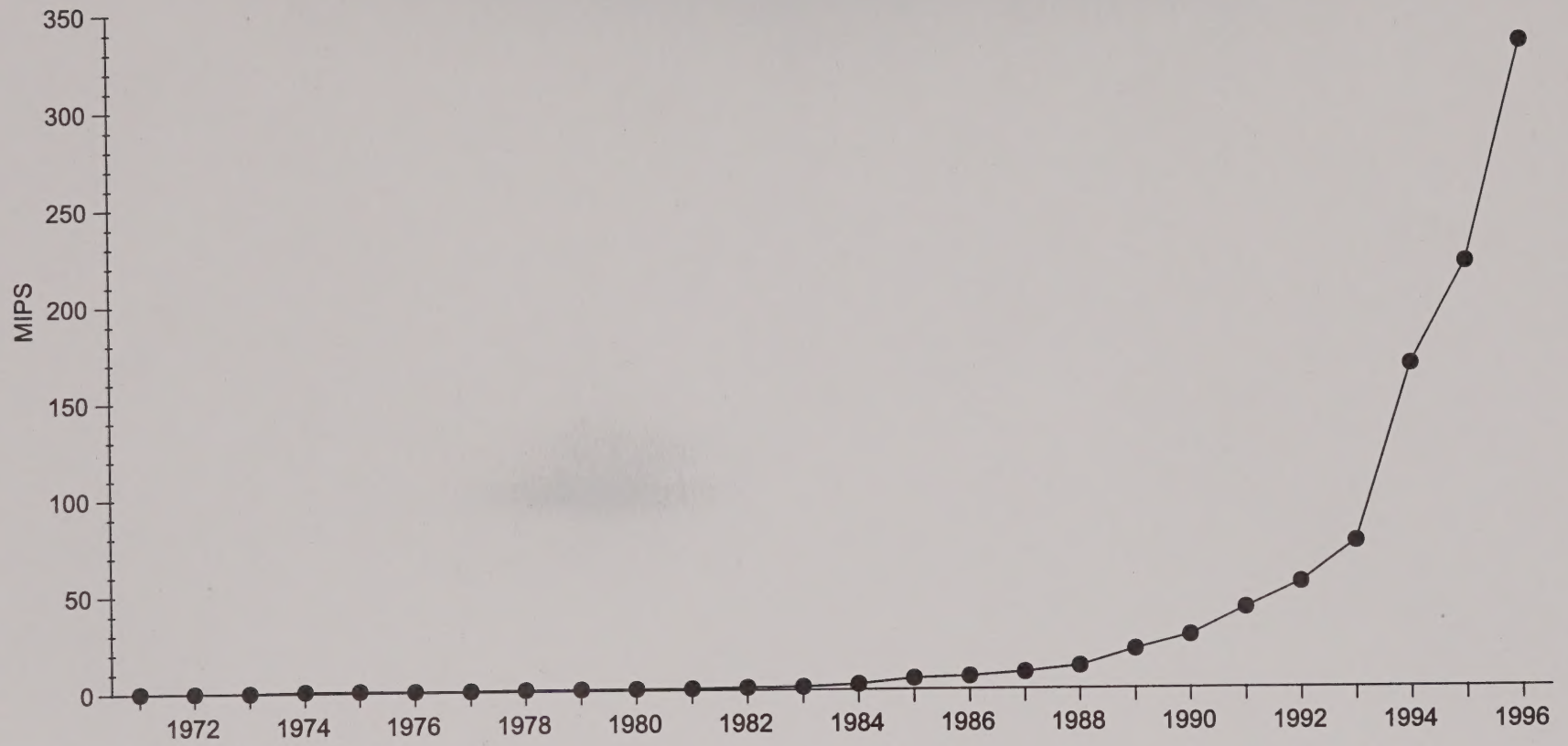
GROWTH OF GREATEST AVAILABLE STORAGE CAPACITY OF SINGLE-SPINDLE DEVICES, 1971–1996 (MB)



Source: International Data Corporation, 1996

In 1971 the largest-capacity, commercially available, single-spindle disk held 100MB of data. After strong increases in the early 1990s, the maximum capacity has remained at 9000MB since 1993. The next increase in storage capacity, to 23,000MB, is expected in 1997.

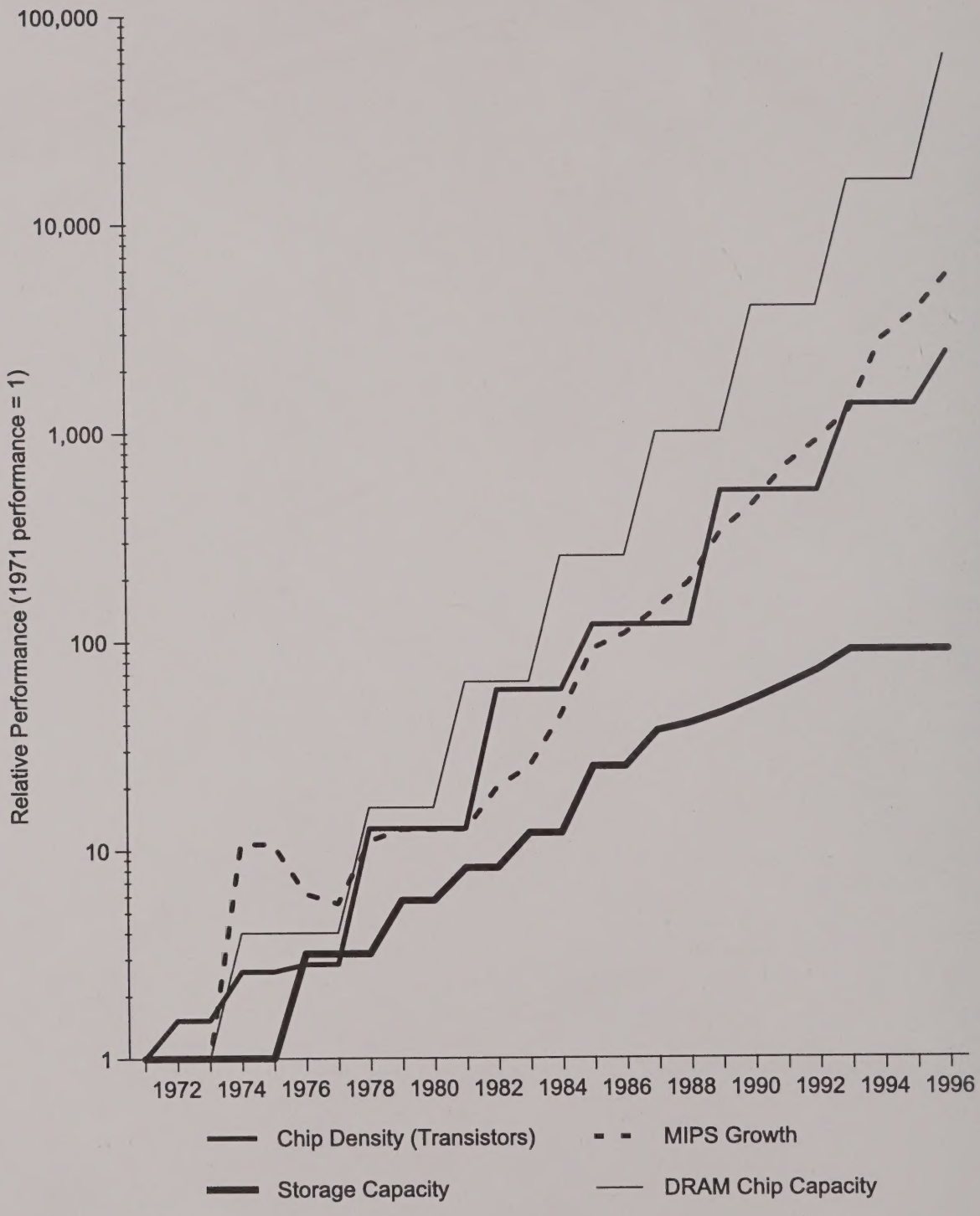
MIPS Growth in Intel Processors, 1971–1996



Source: International Data Corporation, 1996

Performance advance in Intel microprocessors has been a direct function of transistor density. Although performance measured in MIPS across families of microprocessors can lead to inaccurate comparisons, it can be used to demonstrate clearly improvements within one processor architecture.

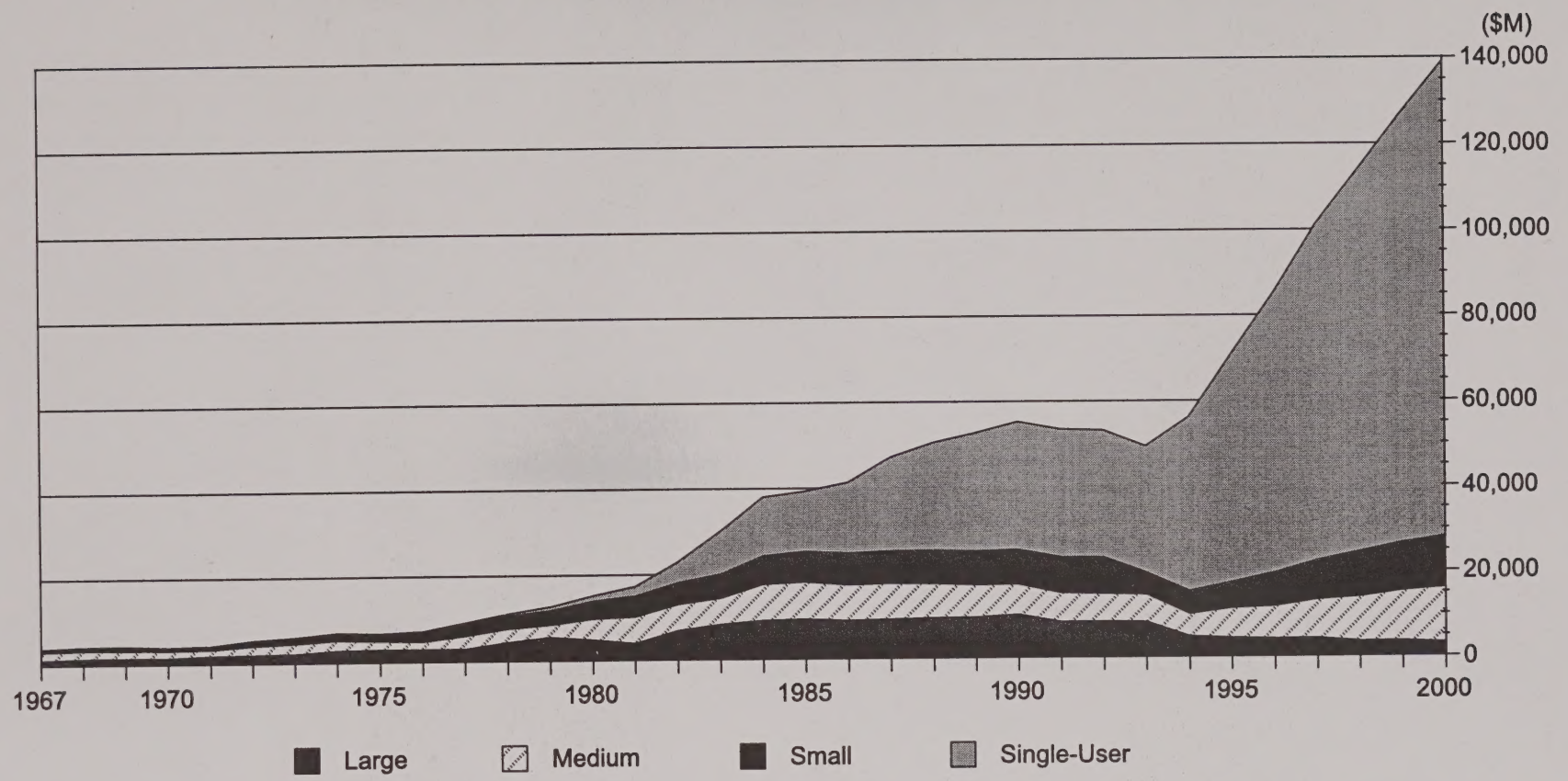
RELATIVE PERFORMANCE INCREASES OF FOUR TECHNOLOGIES, 1971–1996



Source: International Data Corporation, 1996

In this chart, the performance increases of the four technologies are compared with the 1971 "base" level. For example, transistor density (which in part drives MIPS and DRAM capacity) has increased 64,000-fold. Storage capacity, by comparison, has increased 90-fold.

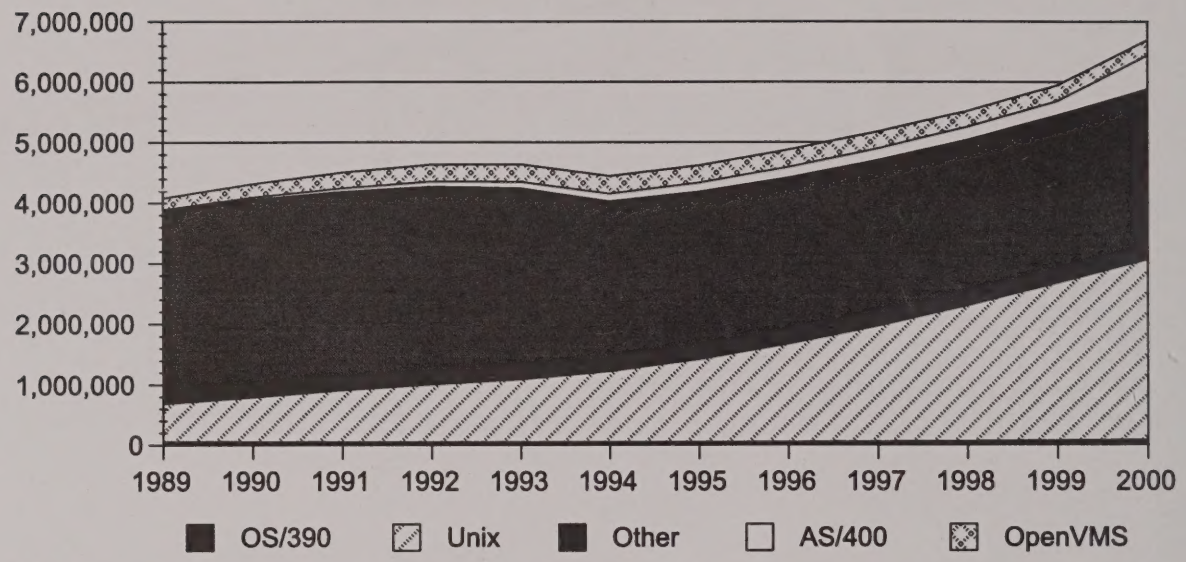
U.S. Market for Multiuser and Single-User Systems, 1964–2000 ($M)



Source: International Data Corporation, 1996

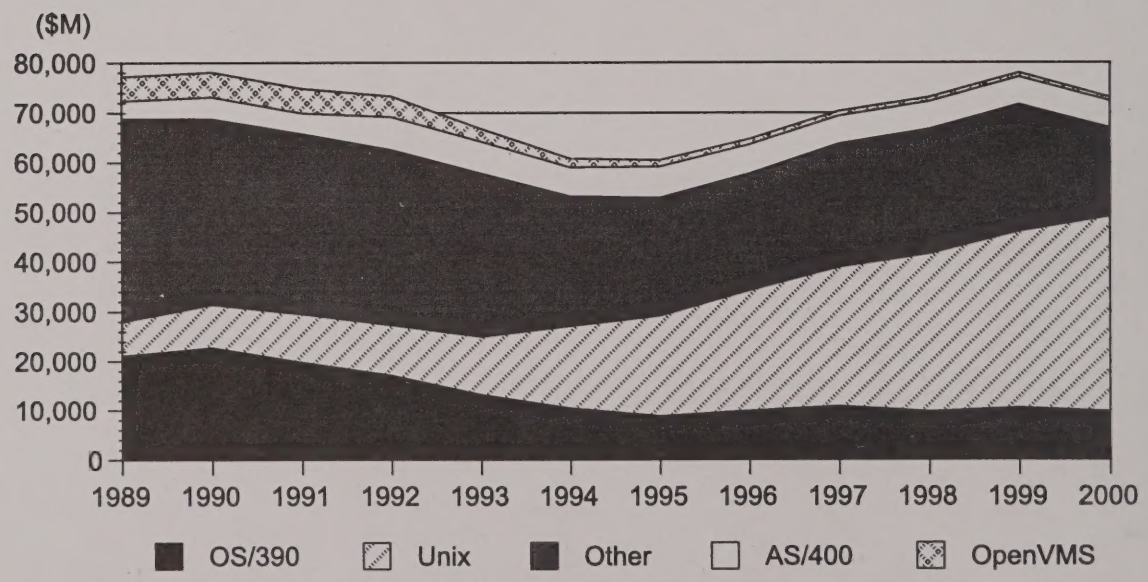
It's hard to believe that within the past ten years spending on multiuser and single-user systems was equal. But there's been no looking back since 1988: by 2000 spending on PCs will dwarf spending on multiuser systems by nearly a factor of three.

Worldwide Installed Base of Multiuser Systems by Operating Environment, 1989–2000



Note: OS/390 includes legacy systems such as S/370; AS/400 includes S/3X.
Source: International Data Corporation, 1996

Worldwide Multiuser System Value of Shipments by Operating Environment, 1989–2000 ($M)

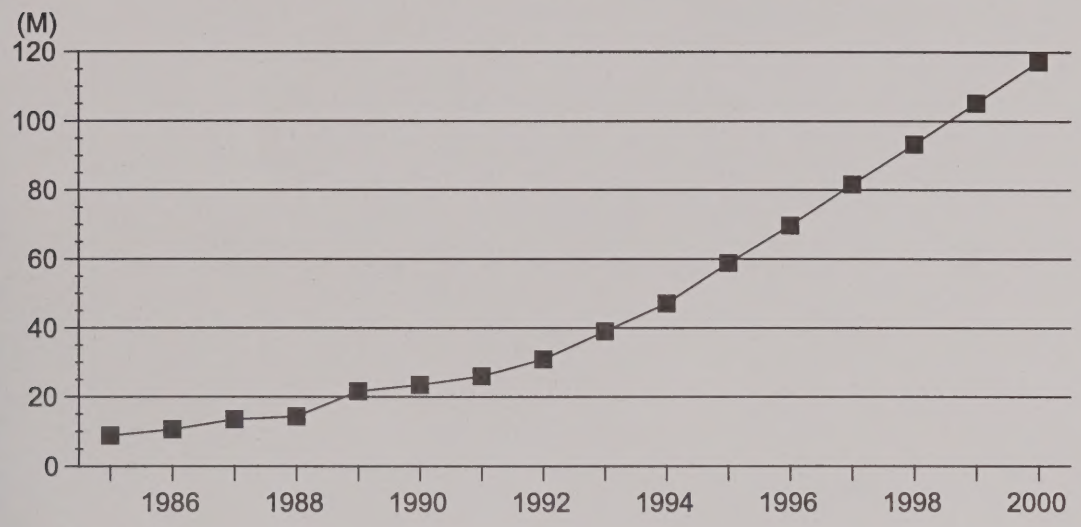


Note: OS/390 includes legacy systems such as S/370; AS/400 includes S/3X.
Source: International Data Corporation, 1996

The slow decline in the installed base of non-OS/390, Unix, AS/400, and OpenVMS systems will not reverse until 1999, when NT shipments kick into higher gear. Nonetheless, "other" remains the largest category and will not look up to Unix until 2000.

Revenue from sales of all varieties of systems will stabilize somewhat over the next three to four years, with only Unix systems showing revenue growth, and a more moderate growth than historically at that.

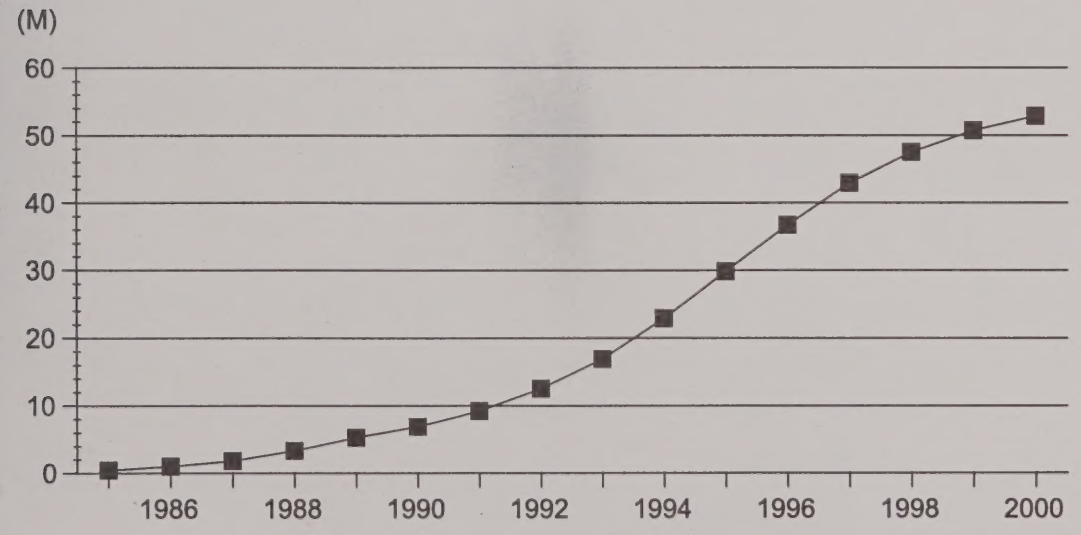
Worldwide Shipments of PCs, 1985–2000



Source: International Data Corporation, 1996

1996: End of the PC heyday? The period of 1993–1995 saw unparalleled expansion of the worldwide PC market. IDC expects a more moderate growth (13.9%) to prevail through 2000, though in a more mature marketplace, not nearly so up-and-down as the 1986–1992 years.

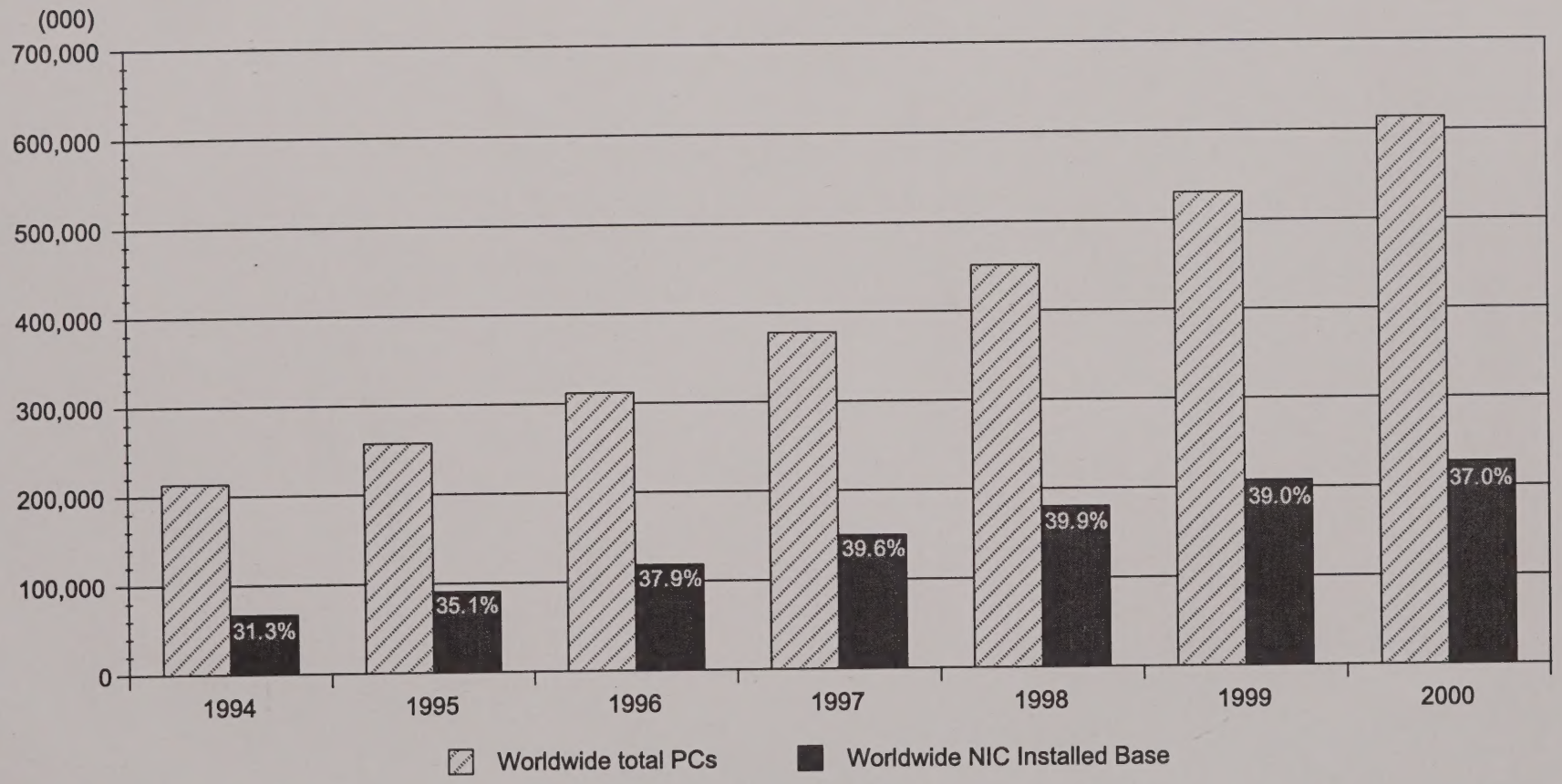
Worldwide PC Network Interface Card Shipments, 1985–2000



Source: International Data Corporation, 1996

What IT market segment grows faster than personal computers? LAN interface cards, for one. The shift to motherboard networking could slow this growth dramatically in the next five years. IDC forecasts 9.5% incremental growth through 2000.

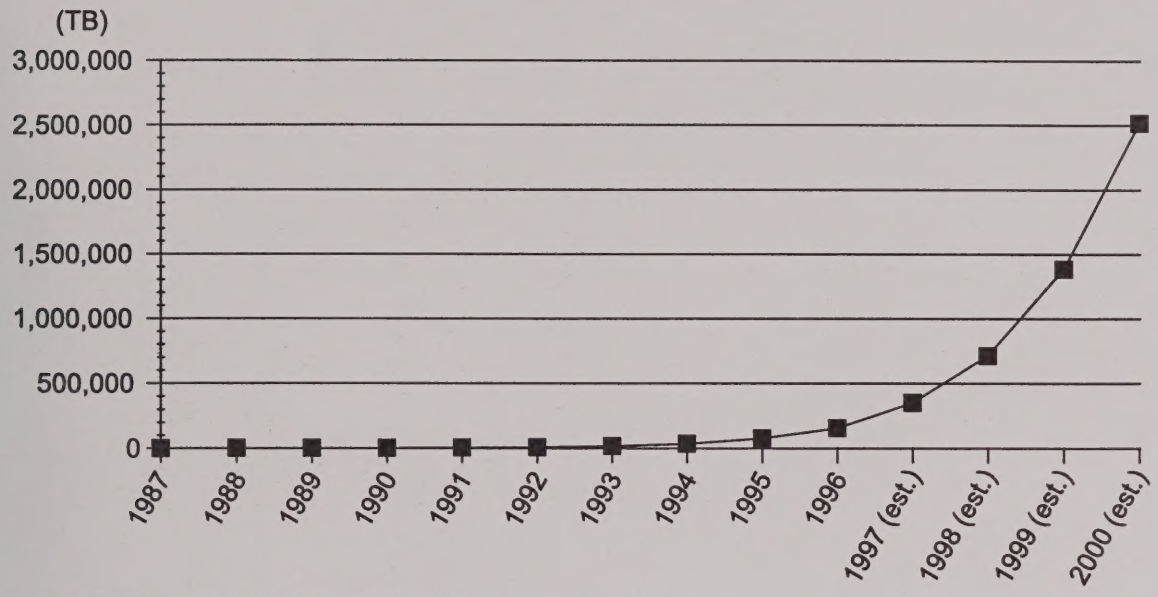
Worldwide NIC Penetration on PCs, 1994–2000



Note: Worldwide PCs includes business and home installed base.
Source: International Data Corporation, 1996

The portion of PCs with NICs provides a reasonable estimate of the number of PCs connected to LANs. The percentage declines in the final two years of the forecast because of the increase in home PC penetration, but the actual number of PCs on LANs will continue to grow slightly.

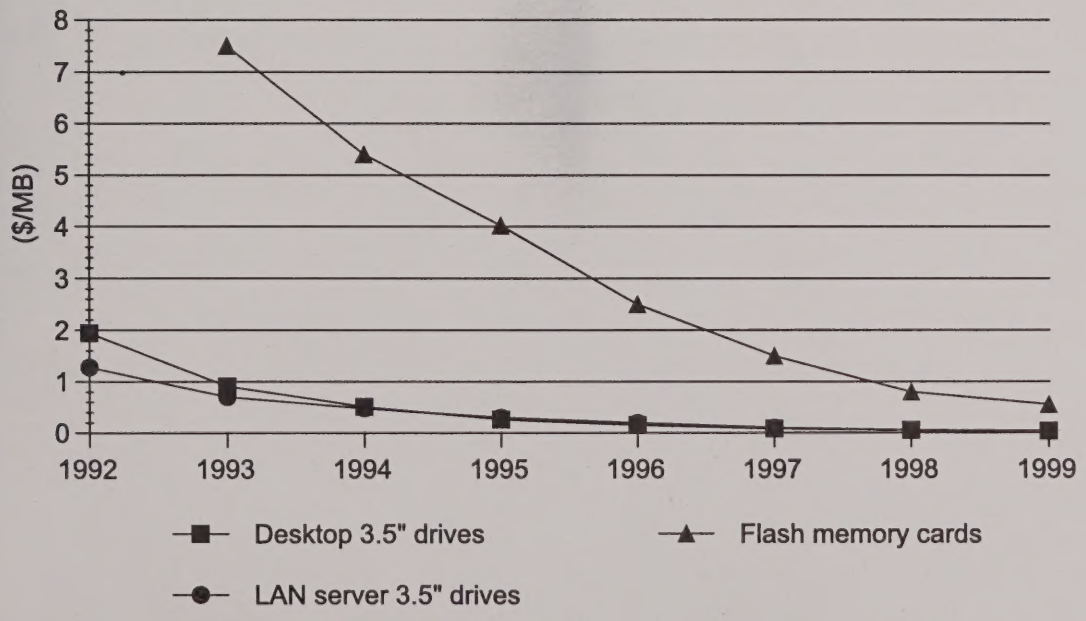
STORAGE EXPLOSION: GROWTH IN WORLDWIDE STORAGE SHIPMENTS, 1987–2000 (TERABYTES)



Source: International Data Corporation, 1996

Worldwide storage shipments have been increasing dramatically year over year (in some cases nearly doubling). This trend will continue through 2000 in part because of the high storage demands of multimedia applications.

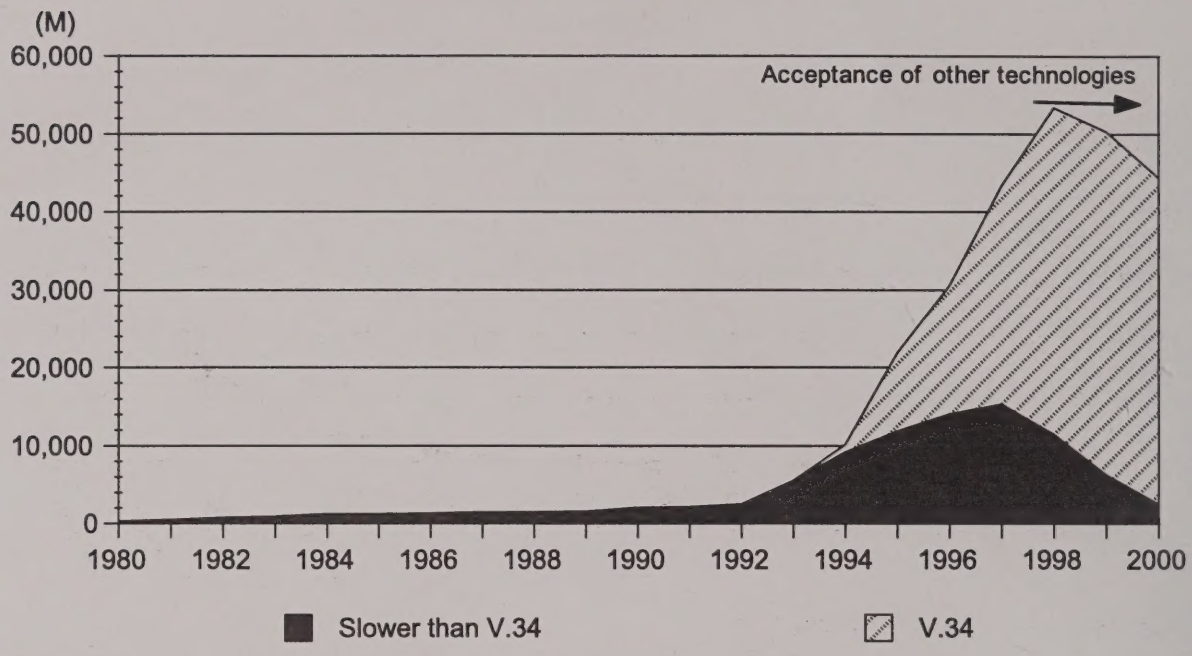
DRAMATIC PRICE DECLINES: AVERAGE PRICES OF SELECTED MEMORY DEVICES, 1992–1999



Source: International Data Corporation, 1996

All memory is falling in price through the end of the decade. The most expensive, flash memory, has the steepest decline; it reaches near parity with desktop and LAN server drives by 1999.

Worldwide Modem Shipments, V.34 and Faster vs. Slower than V.34, 1980–2000



Note: Total cumulative shipments: Slower than V.34 = 93,862,883; V.34 = 183,135,819
Source: International Data Corporation, 1996

Beginning with the sales of <1,200 baud modems, the modem market experienced steady growth from 1980 until 1992. From 1992, Internet mania pushed modem sales at a fevered pitch. Despite its late start, the total number of V.34 modems shipped from 1992 to 2000 will nearly double the total number of slower-than-V.34 modems shipped from 1980–2000. The V.34 and faster-than-V.34 modem numbers may increase more than is forecast dependent on the acceptance of 56Kbps modems.

From a worldwide perspective, many users will forego modems in 2000 to adopt other technologies. The forecast cumulative shipments of ISDN, ADSL, and cable modems combined will be 11.7 million in the United States alone in 2000. The United States is not expected to be the greatest market for these technologies.

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Computer Industry Report

THE GRAY SHEET

Global market intelligence on the information technology industry since 1964.

Change in the IT Industry: A Pictorial History, Part II

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January 15, 1997
IDC #12906
Vol. 31, No. 21

Change in the IT Industry: A Pictorial History, Part I illustrated the development of key technologies and their likely continued growth, but the startling growth in these technologies — microprocessor speed, cheap storage, and a host of communications technologies, among others — tells only half the story.

Of greater interest to industry planners are answers to key questions about the implications of these technologies: how, where, and why are they put to use? For example:

- How is the worldwide market for IT products and services split by region? By country?
- Which countries are growing fastest and why?
- What percentage of a nation's GDP is spent toward information technology? Does the percentage differ for developing and developed country markets?
- How have major suppliers grown with the worldwide market? How does their growth affect the structure or stability of supply?
- Finally, how soon will worldwide markets accept the Internet?

This second historical issue, analyzing the growth of the worldwide IT industry, shifts gears. Rather than the display of the growth in capabilities and sales of the core technologies driving the IT revolution, the focus is on the implications of these technologies.

The concentration of such historical data can provide more than a lesson in the industry's past. This data provides comparative background for reports, presentations, and marketing materials. It offers a measure of what technologies succeeded and provides a benchmark for technologies of the future.

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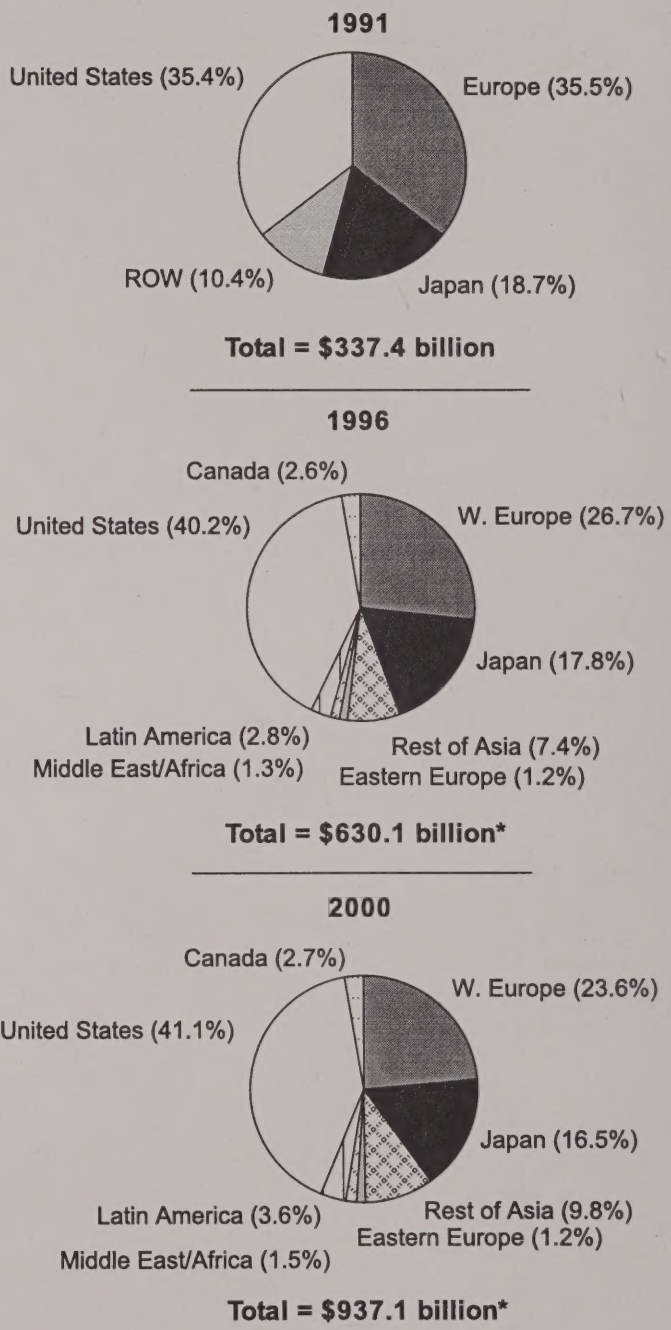
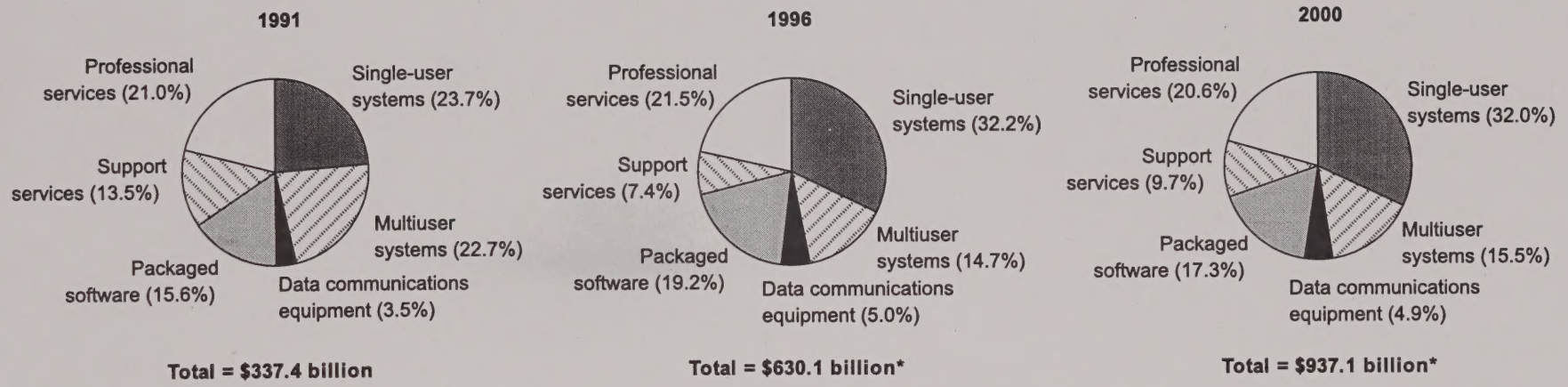
WORLDWIDE IT SPENDING BY REGION: 1991, 1996, AND 2000



Note: * = 1995 dollars.
Source: International Data Corporation, 1997

In 1991, the Eastern Europe, Middle East, Latin America, and Rest of Asia regions were small enough to be grouped as Rest of World. As we approach 2000, these regions will increase their share of the world IT market. Asia (without Japan) and Latin America will grow 19% and 18%, respectively, from 1995 to 2000. The Middle East and Eastern Europe will grow 14% and 13%, respectively, for the same time period.

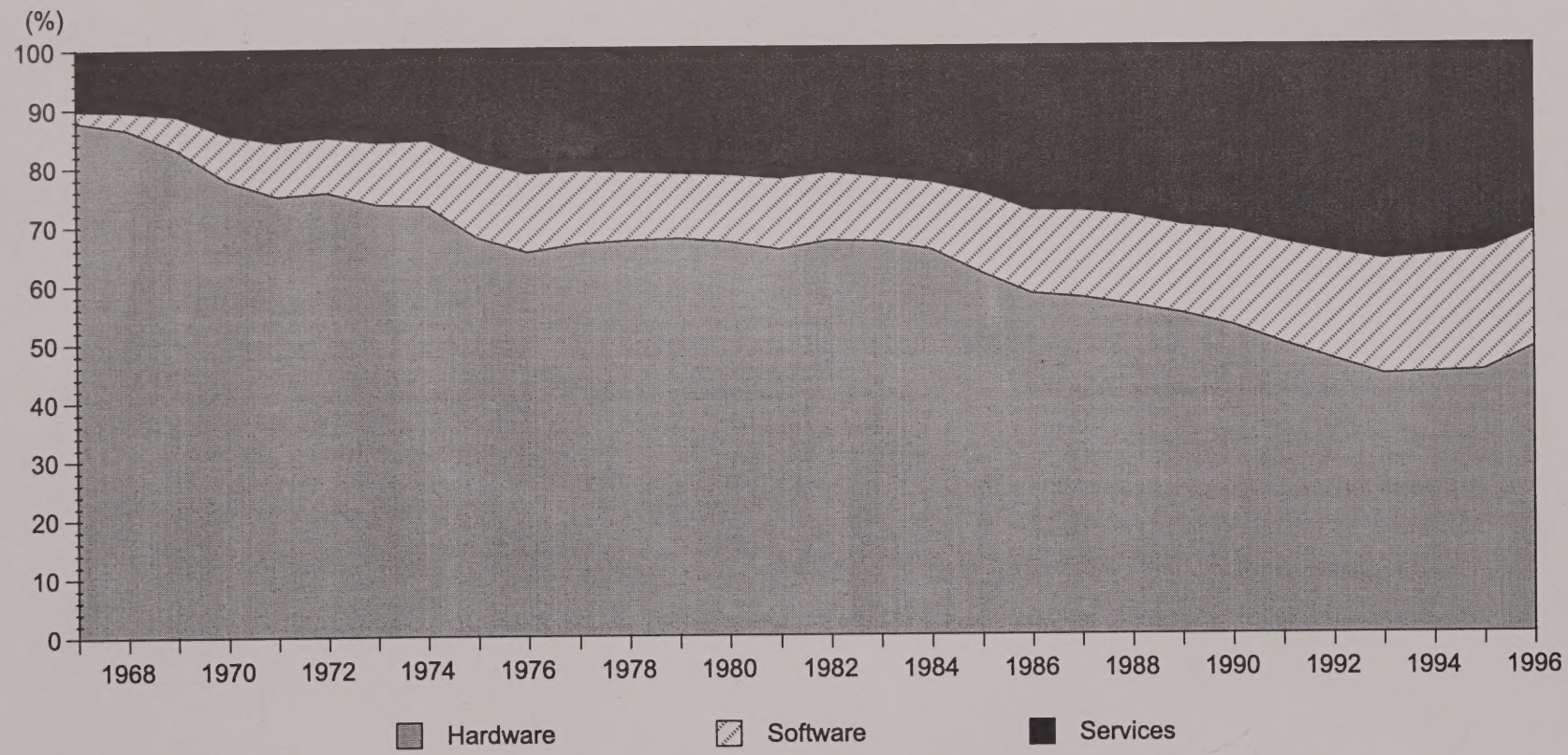
WORLDWIDE IT SPENDING BY HARDWARE/SOFTWARE CATEGORIES: 1991, 1996, AND 2000



Note: * = 1995 dollars.
Source: International Data Corporation, 1997

Multiuser systems have suffered a dramatic decline in share of total IT spending, but their share is expected to level off in the next five years. Multiuser systems' loss has been personal systems' gain. PCs and single-user systems account for one-third of the worldwide IT market.

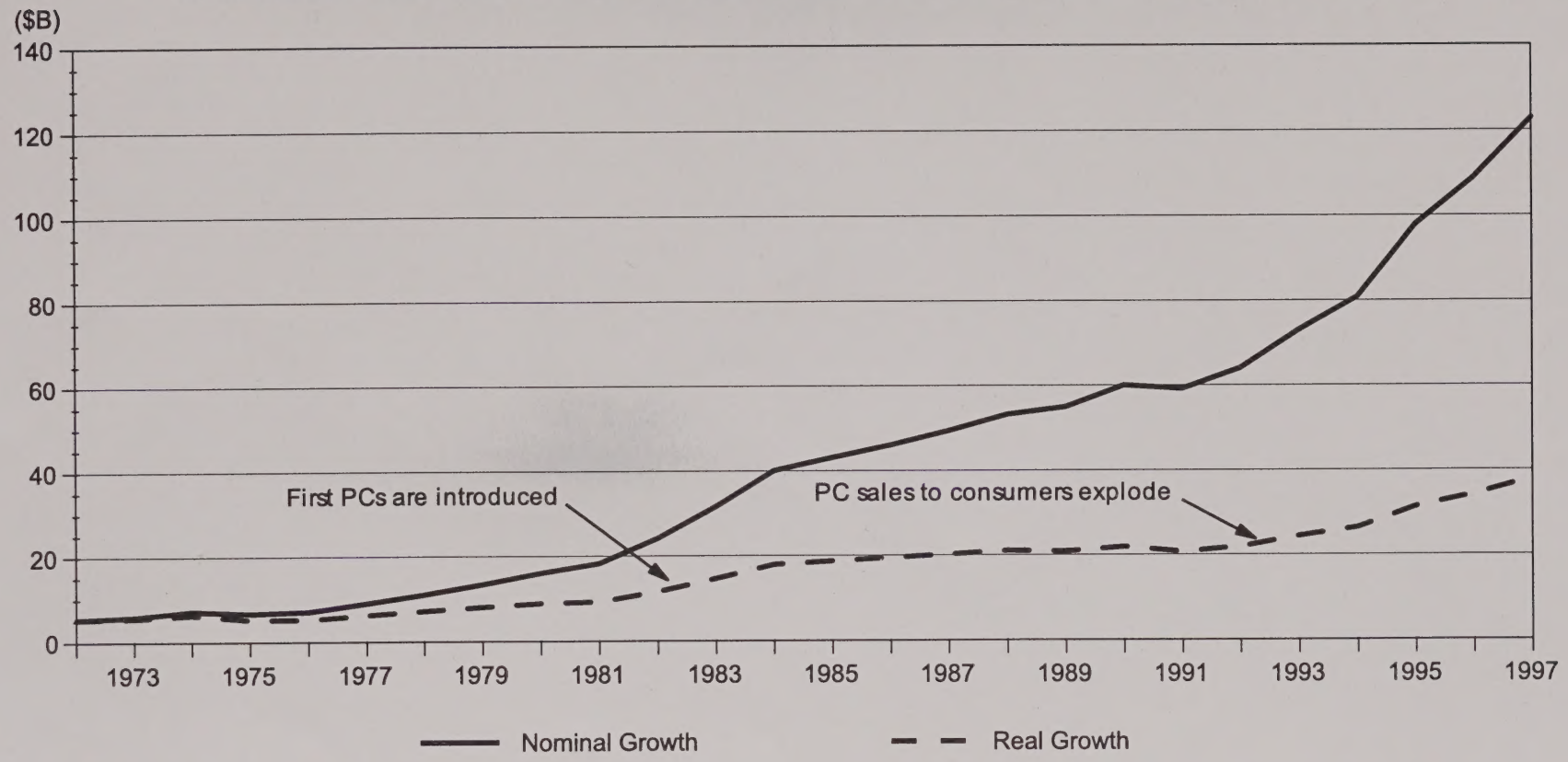
UNITED STATES IT SPENDING PERCENTAGE BY HARDWARE, SOFTWARE, AND SERVICES



Source: International Data Corporation, 1997

Hardware revenue, the lion's share of the U.S. IT market 30 years ago, declined steadily as a portion of the market until 1993, when PC sales took off. Hardware's decline in revenue share indicates the steadily increasing demand for software and support as user IT needs have changed.

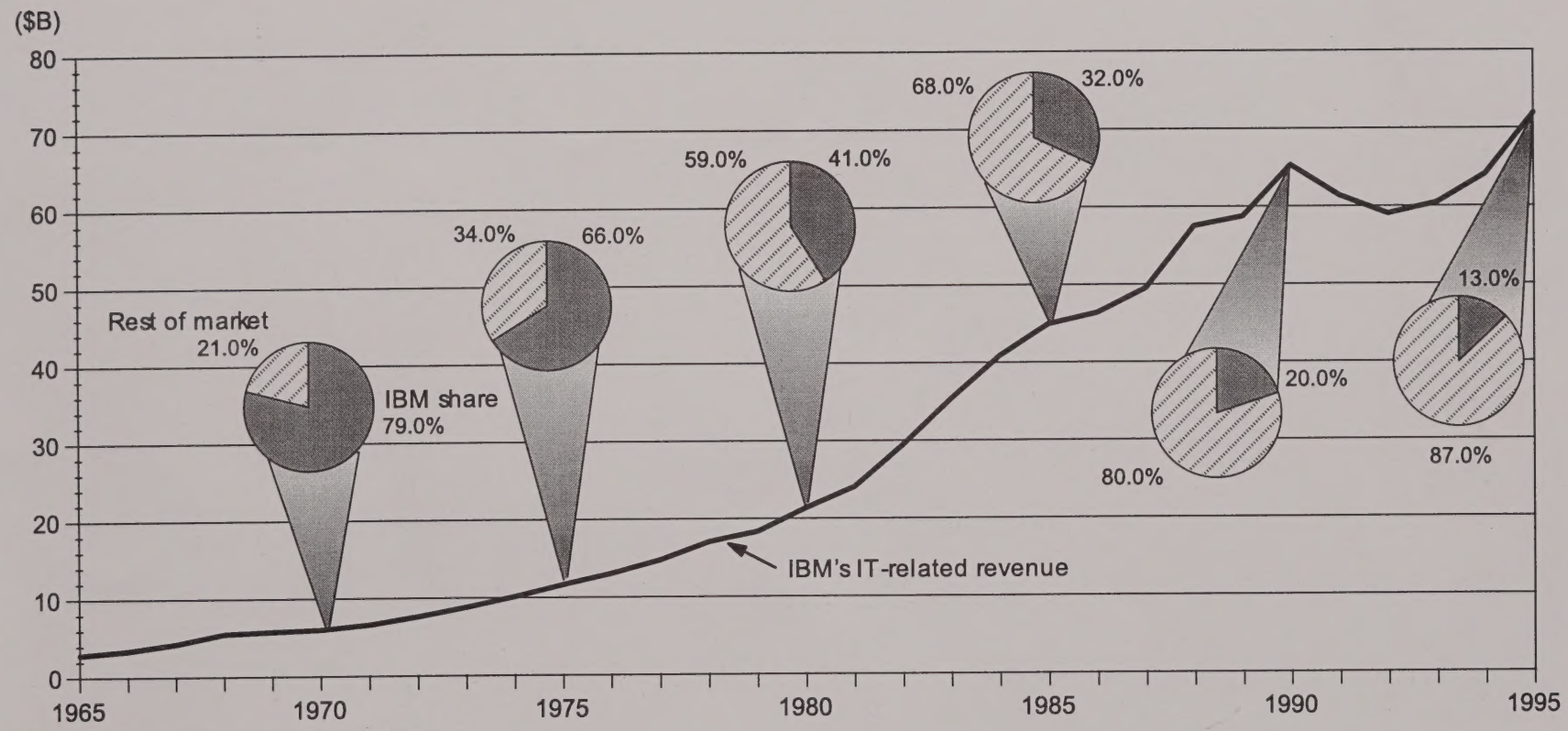
NOMINAL AND REAL GROWTH OF THE U.S. COMPUTER HARDWARE MARKET, 1972–1997



Note: Real growth is in 1972 dollars.
Source: International Data Corporation, 1997

Real growth shows how the IT market has increased in the past 25 years when yearly inflation is removed from the growth calculation. The IT market's nominal growth rate compounded annually since 1972 is 13.4%; real growth rate is only 8.1%. Real growth more accurately shows spikes (sudden growth) in the market, as when the first PCs were introduced in the early 1980s and home PC consumption exploded in the early 1990s.

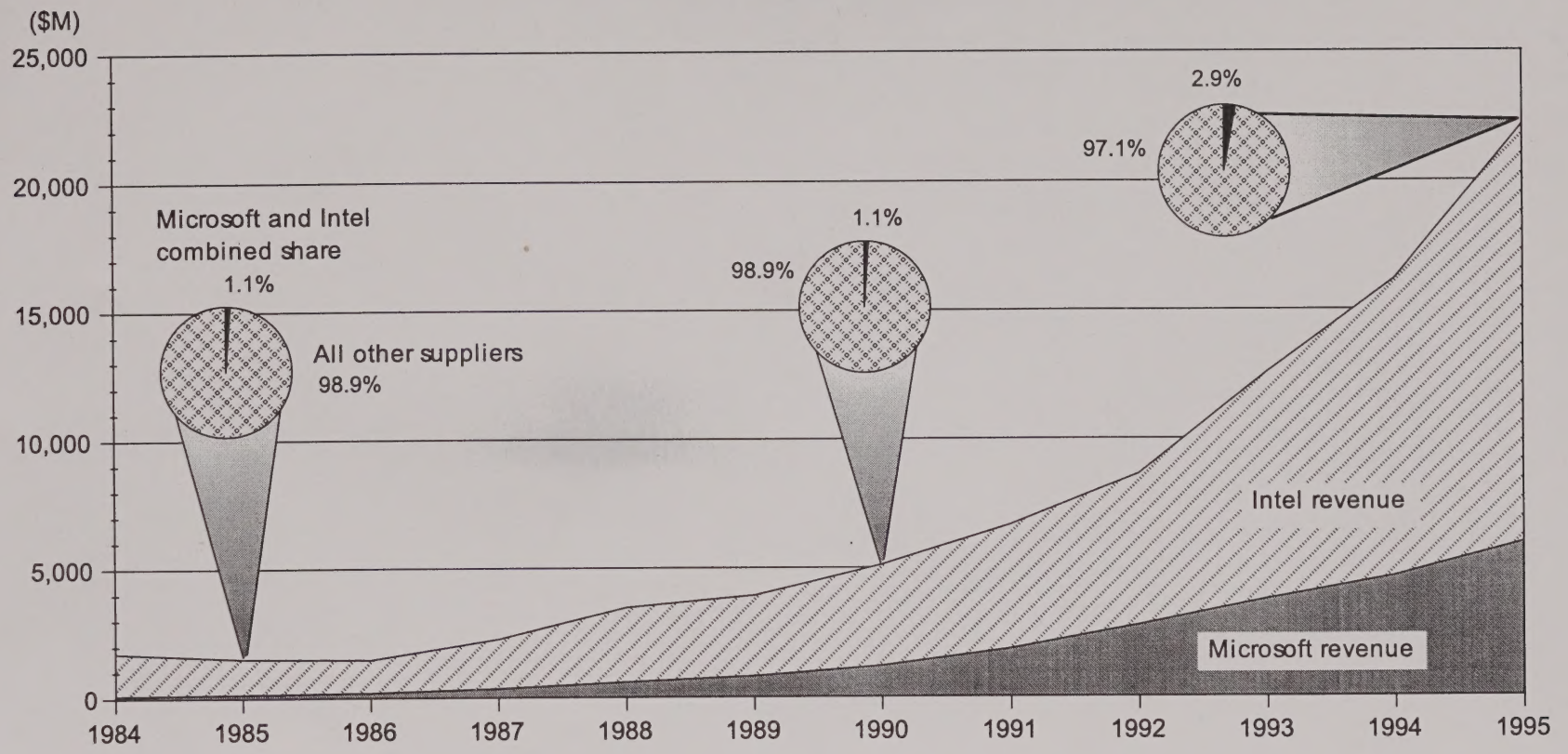
IBM's IT-Related Revenue and Overall Worldwide IT Market Share



Source: International Data Corporation, 1997

IBM's downward slide in revenue ended in 1993, and from 1993 to 1995 the company exhibited strong growth. The 12% growth from 1994 to 1995 is IBM's best performance since 1987–1988. Nonetheless, IBM's overall share and influence over the entire industry are changing.

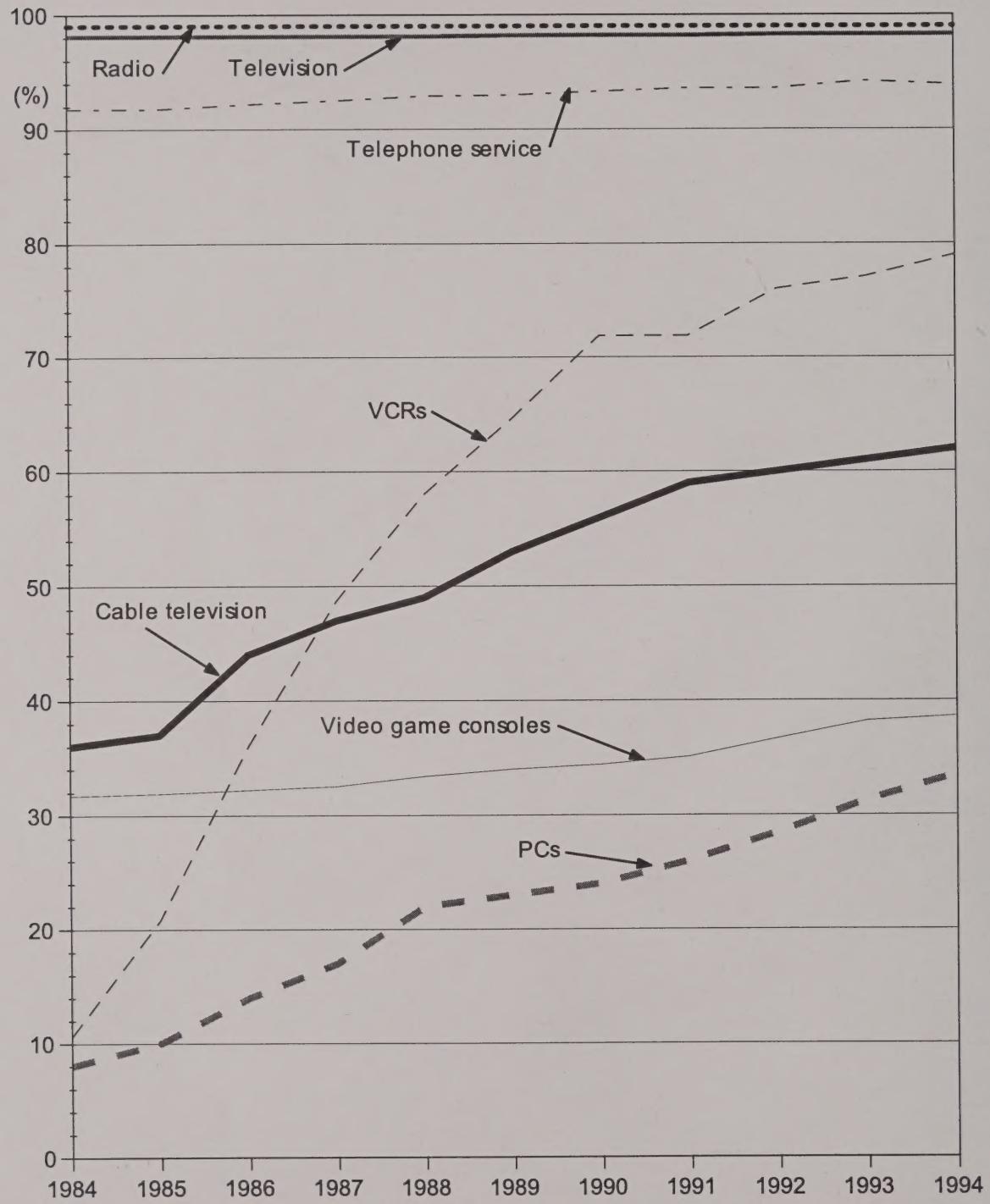
WORLDWIDE IT-RELATED REVENUE AND COMBINED MARKET SHARE FOR MICROSOFT AND INTEL, 1984–1995



Source: International Data Corporation, 1997

Although IBM's share of the worldwide IT market is gradually declining, the leading software maker and the leading chip maker have combined to grab an increasing share. However, this increasing share (3%) is still but a sliver of the industry. The notion of Intel and Microsoft dominating the industry is still but an illusion.

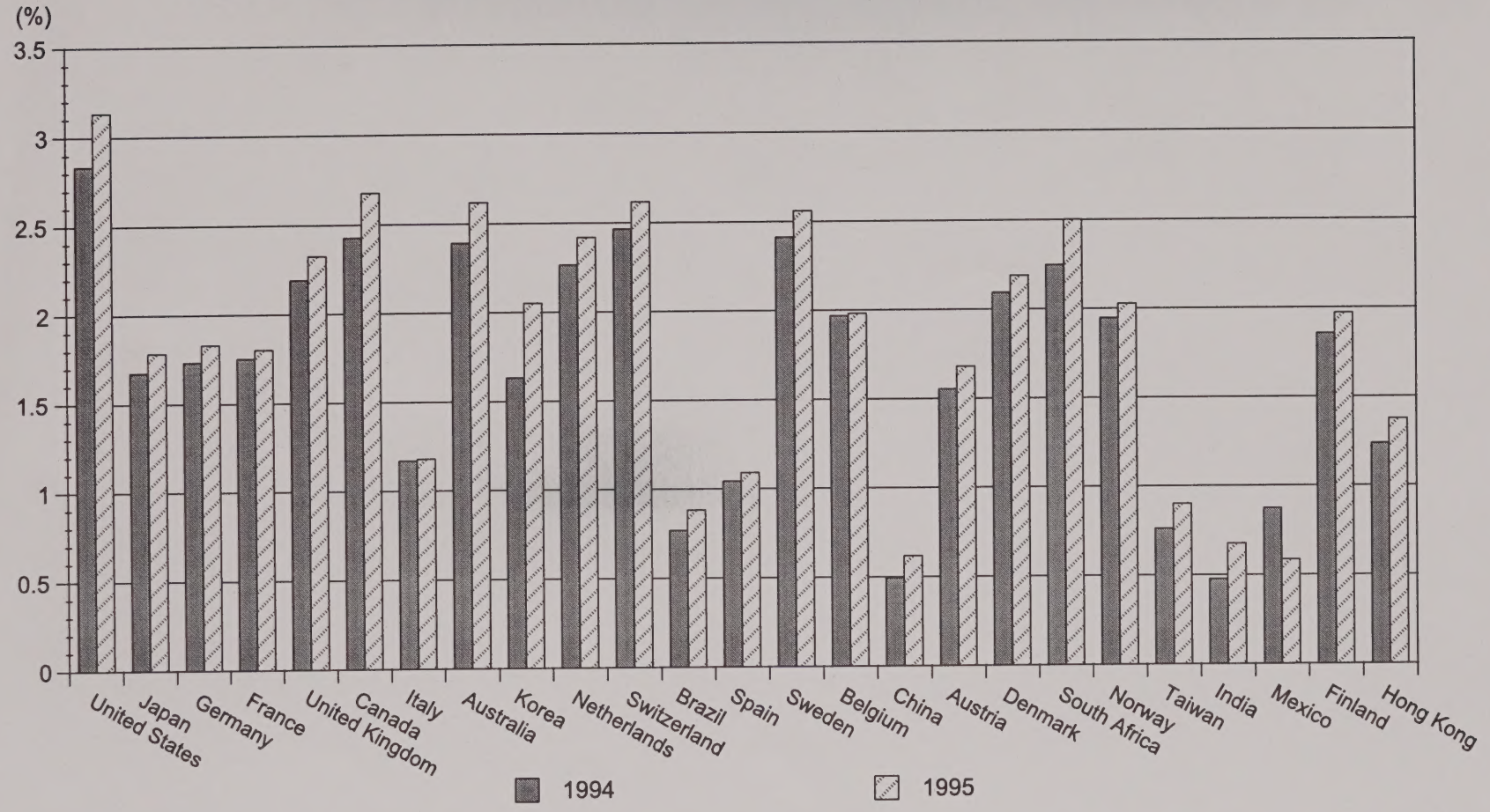
PENETRATION OF ELECTRONIC MEDIA IN U.S. HOUSEHOLDS, 1984–1994



Source: International Data Corporation and Link Resources Corporation, 1997, and the Statistical Abstract of the United States, 1996

PCs are increasing their presence in the home steadily in the United States, if not at lightning speed. Like PCs, video game consoles are not ubiquitous, but their presence is increasing, indicating a growing acceptance of interactive products in the home.

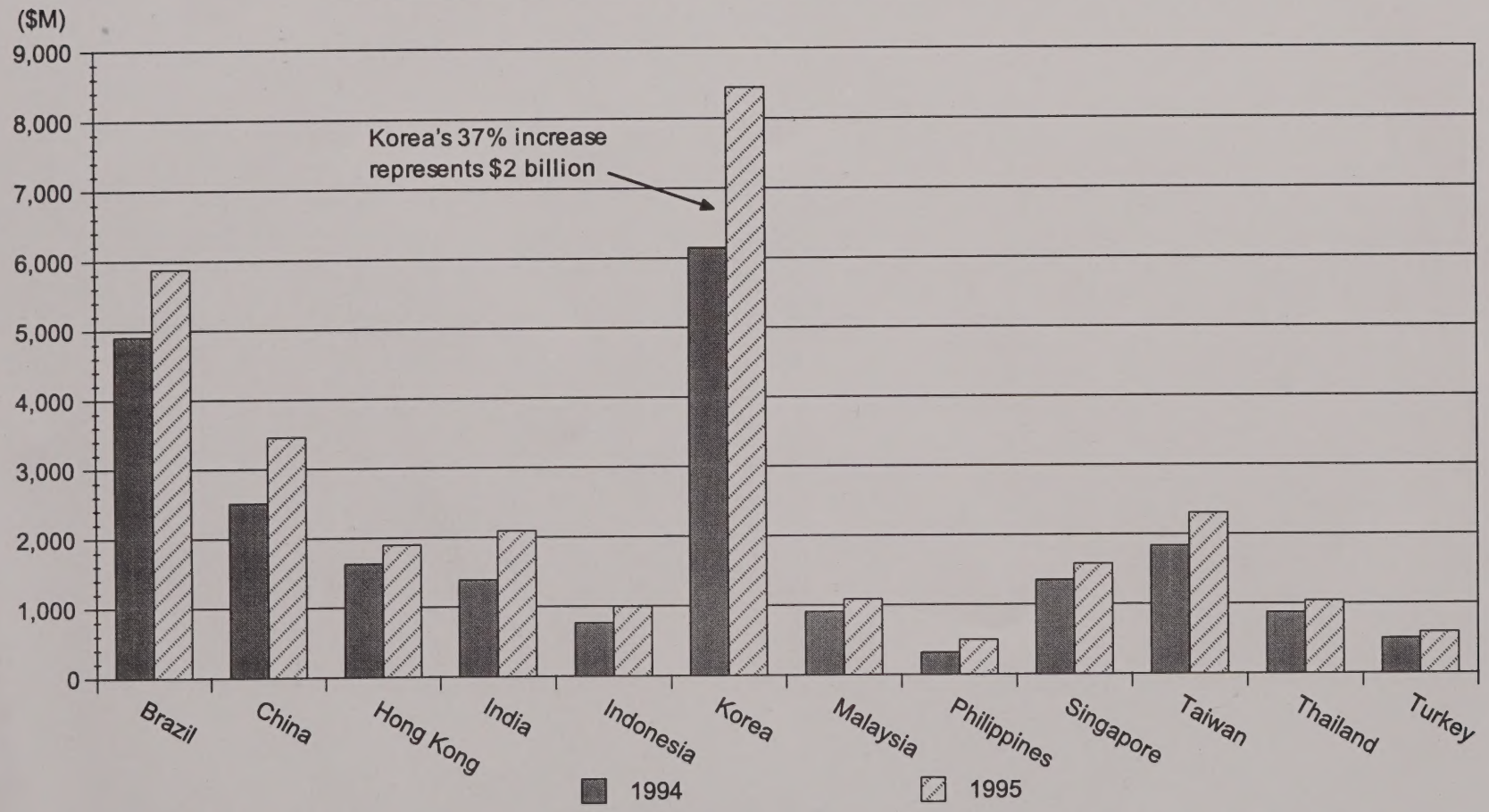
IT Spending as a Share of GDP in Top 25 Country Markets Worldwide, 1994–1995



Source: International Data Corporation, 1997

In developed countries, IT spending accounts for as much as 3% of the total GDP; from 1994 to 1995 the IT share of GDP grew 9% on average. In this graph, countries are organized by GDP size declining to the right. Interestingly, the nation with the second largest GDP in the world, Japan, does not spend a comparatively high portion of its GDP on IT.

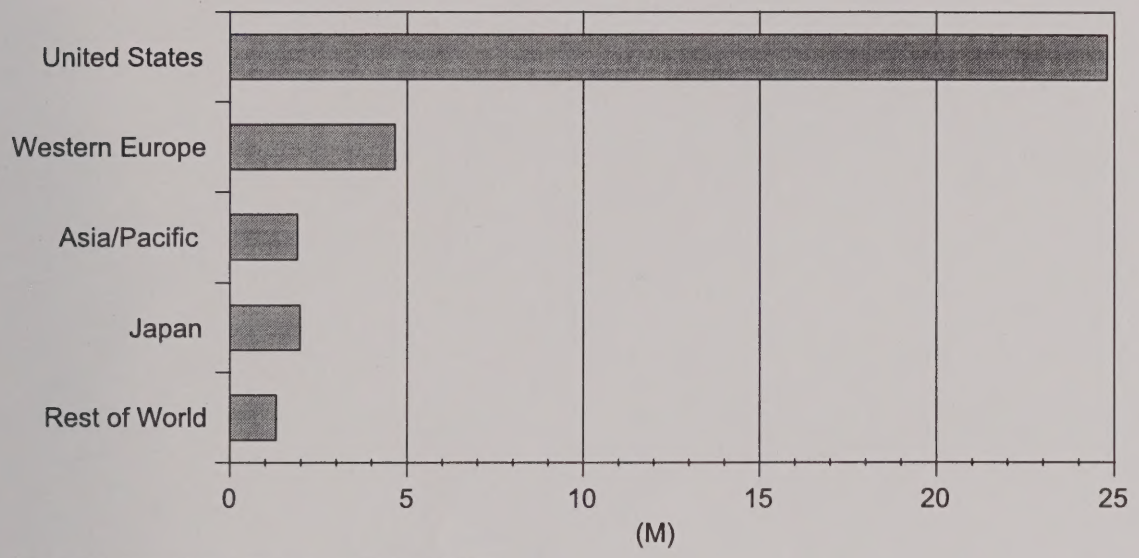
INCREASES IN IT SPENDING IN 12 EMERGING MARKETS, 1994–1995



Source: International Data Corporation, 1997

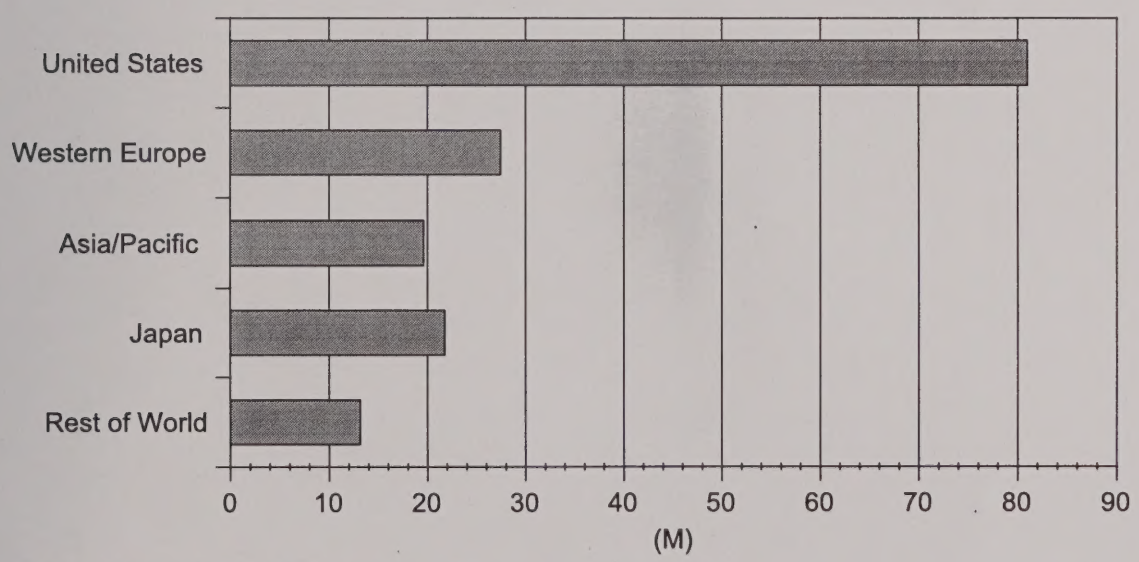
Markets in the early stages of IT development are showing dramatic increases in spending on IT. Fastest growth rates were found outside Western Europe. Latin America and Asia/Pacific countries dominate the list of quick growers.

World Wide Web Users by Region, 1996



Source: International Data Corporation, 1997

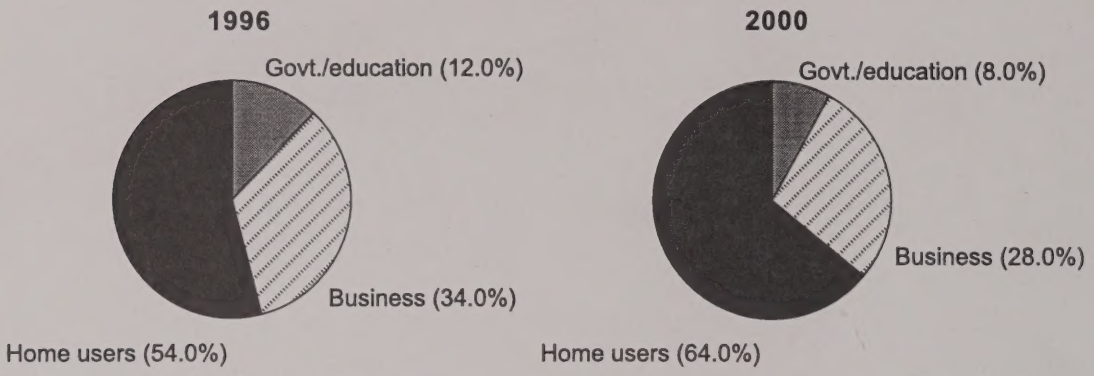
World Wide Web Users by Region, 2000



Source: International Data Corporation, 1997

The United States, which leads the world in PC penetration, not surprisingly leads the world in Internet connectivity. In 1996, the United States accounted for more than 70% of the world's Web users. In 2000, Western Europe, Asia/Pacific, and Japan will have increased their numbers of users and balanced the world share at 50% for the United States and 50% for all others.

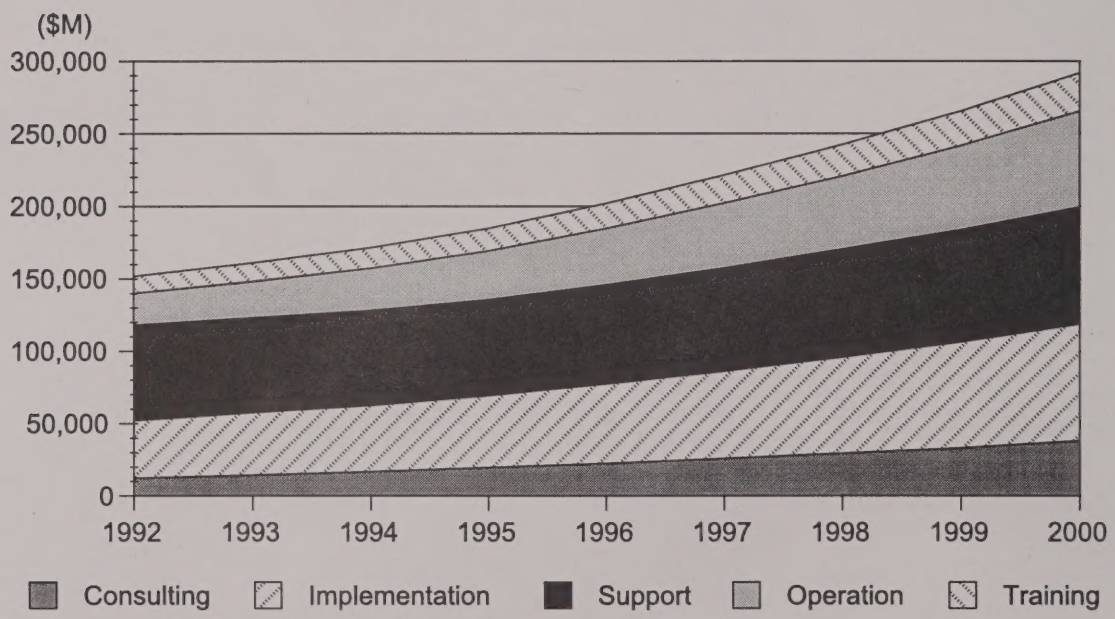
WORLD WIDE WEB USERS BY SEGMENT, 1996 AND 2000



Source: International Data Corporation, 1997

All the hype about the World Wide Web has pushed Internet connectivity from the realm of scientists and engineers and into public consumption; thus home users account for most of the Internet use and will account for more in 2000. Hardware vendors bundling Internet software with their products have further advanced Internet connectivity into the home segment.

WORLDWIDE SERVICES SPENDING BY ACTIVITY, 1992–2000



Source: International Data Corporation, 1997

Although incremental growth for the overall services industry from 1996 to 2000 is 9%, most segments will do much better. Support services are at flat or moderate levels because of increased hardware reliability and the acceptance of PCs.

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Global market intelligence on the information technology industry since 1964.

1996 Winners and Watchers: Some IT Companies Won Big, Others Watched Success Pass By

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February 1, 1997

IDC #13064

Vol. 31, Nos. 22 & 23

In the swift currents of the information technology industry, success can be measured by performance, perception, or both. Image may not be everything, but sometimes it counts for a lot. In 1996 this axiom held true — to the delight or dismay of some notable industry players.

This issue of *The Gray Sheet* profiles the stories behind the results for a handful of companies in a spectrum of different segments of the IT industry. The winners and losers discussed herein have been chosen not necessarily by size or by common theme, but by the background surrounding their results.

Success or failure depends on the method of measurement, and different methods can yield different results. We have measured companies' financial performance by change in net sales through the course of calendar year 1996. We have measured the public's perception and expectations by the change in companies' stock prices for the same period. Many times we found strong performance essential for favorable perception. Sometimes we did not.

The area of the IT industry that exerted pronounced direct and indirect influence over nearly all of the companies profiled in this issue is the Internet. For some companies, the shift to the era of the virtual consumer is bringing great fortune; for others it is bringing despair:

- In 1996, Cisco rode the wave of connectivity to record-breaking revenues and market share because of its dominance in the router market and other areas of the networking industry.
- Dell used the World Wide Web to generate direct sales and track trends in customer purchasing as it enjoyed a banner year.
- ParcPlace-Digitalk suffered limited opportunity in the Smalltalk software market because of the hype that surrounded a competing programming language, Java.
- AMD has banked on continued Internet-driven multimedia PC sales to spur revenue from its new K6 processor.

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Whether the Internet aided the business or *was* the business, 1996 marked the first year the world of wires made a significant financial impact on the world of brick and mortar. The companies that bridge the gap between the two worlds — and perhaps more important, the companies that use this bridge strategically — will be the companies that lead the industry in the future.

In the background of 1996's success stories, one finds a few common attributes. The companies that won stayed focused on their core competencies (for the most part), and they managed their product introductions carefully. They weren't necessarily best of breed, but they instilled in their markets the *belief* that they offered the best solutions available.

The companies that did not win often failed to beat the clock. Vendors that lacked in timeliness (even by a few weeks) missed millions of dollars in opportunity in 1996, underscoring the trite-but-true observation that the IT world is a fast-moving one.

Ephemerality fostered failure also. Across segments, customers spent their money on the vendors who appeared stable enough to provide strategic solutions and isolated those that could not.

DELL

One of the greatest successes for 1996 is Dell Computer, and its story can be summed up in one word: efficiency. The company's direct-sales business model proved adept for reacting quickly to changing market conditions, and this deftness went straight to the bottom line. Dell improved to become the world's sixth largest PC seller in 1996 from eighth in 1995.

Dell's yearend revenues for quarters ending in 1996 were $6.9 billion, compared with $4.8 billion in sales in 1995. The $2.0 billion increase is 43% year-on-year growth. Approval from the financial community improved even more. Dell's stock opened the year at $17.69 and finished at $53.13 — more than 200% growth.

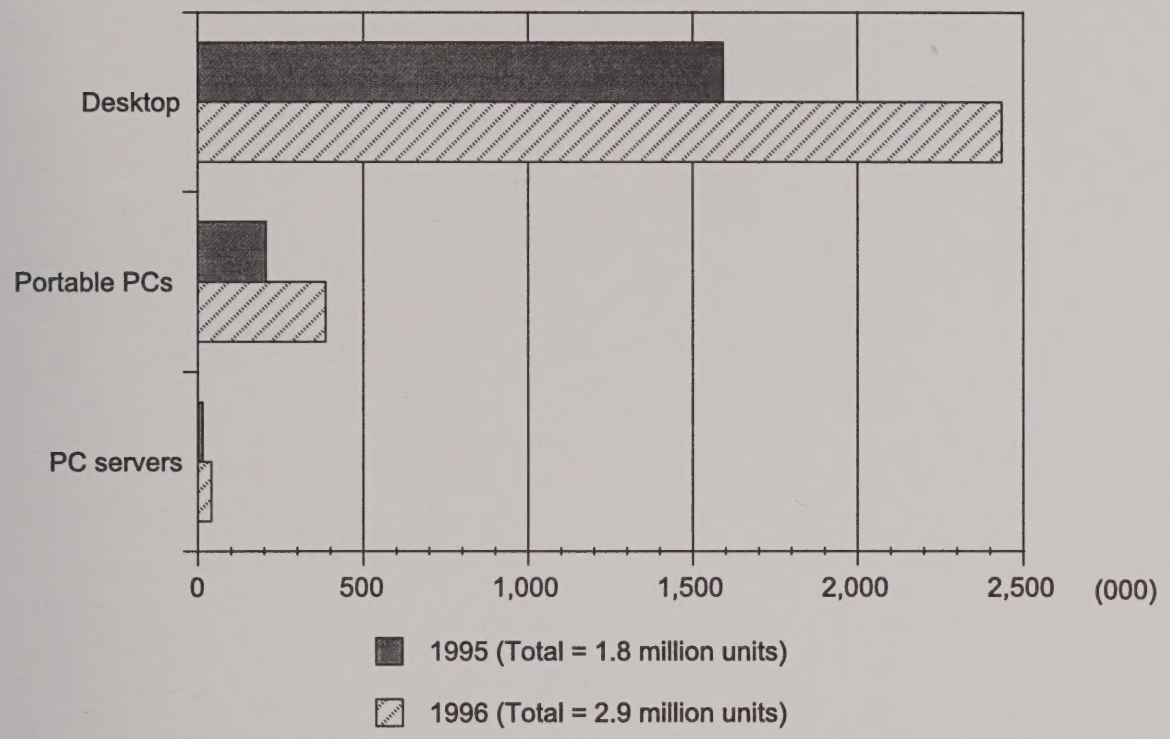
Like other companies profiled in this edition of *The Gray Sheet,* Dell found reward not through leading-edge technology or ubiquitous marketing, but through its core competencies — a strong focus on the corporate market and strong direct sales of build-to-order product.

Dell's competencies brought unexpected profit to two segments of its business. By leveraging its corporate desktop and PC server accounts, Dell nearly doubled its portable business from 1995. By refining its build-to-order model, Dell offered improved server solutions and tripled its server business compared with 1995.

Dell's efficiencies in its sales model were mimicked by its efficiencies in its production process in 1996. The architectural improvements Dell implemented through the course of the year increased potential output.

Combined, these sales and production efficiencies paid off as the quarters passed. Dell earned increasing net incomes of $72 million, $82 million, $103 million, and $149 million, respectively, for the four quarters ending in 1996. (Dell's fiscal year closes at the end of January.)

DELL'S YEAR-ON-YEAR IMPROVEMENTS IN WORLDWIDE PC SHIPMENTS BY FORM FACTOR, 1995 AND 1996



Source: International Data Corporation, 1997

DELL'S PRODUCTS

Dell saw huge gains in shipments in all three segments of the personal systems business in 1996. Overall shipments increased 58% over 1995, to 2.8 million units. Desktops were strong for Dell, but more impressive were the gains the company made in the portable PC and PC server segments. The company shipped nearly 400,000 portable PCs in 1996 (according to preliminary IDC estimates) for a gain of roughly 87% over 1995. Dell shipped nearly 41,000 PC servers in 1996 (according to preliminary IDC estimates) for a gain of roughly 169%.

In the portable market, Dell improved the quality of its offerings. Quality issues had forced it from the portable PC business in late 1994, but changing its OEM partners resolved this issue. Dell was not a technology leader in 1996; as is the company norm, it was last to implement many premium features in its portables. However, portable PC manufacturers that aim to add premium features in 1997 may find a shortage of components, so Dell's 1996 strategy may bode well for the year to come.

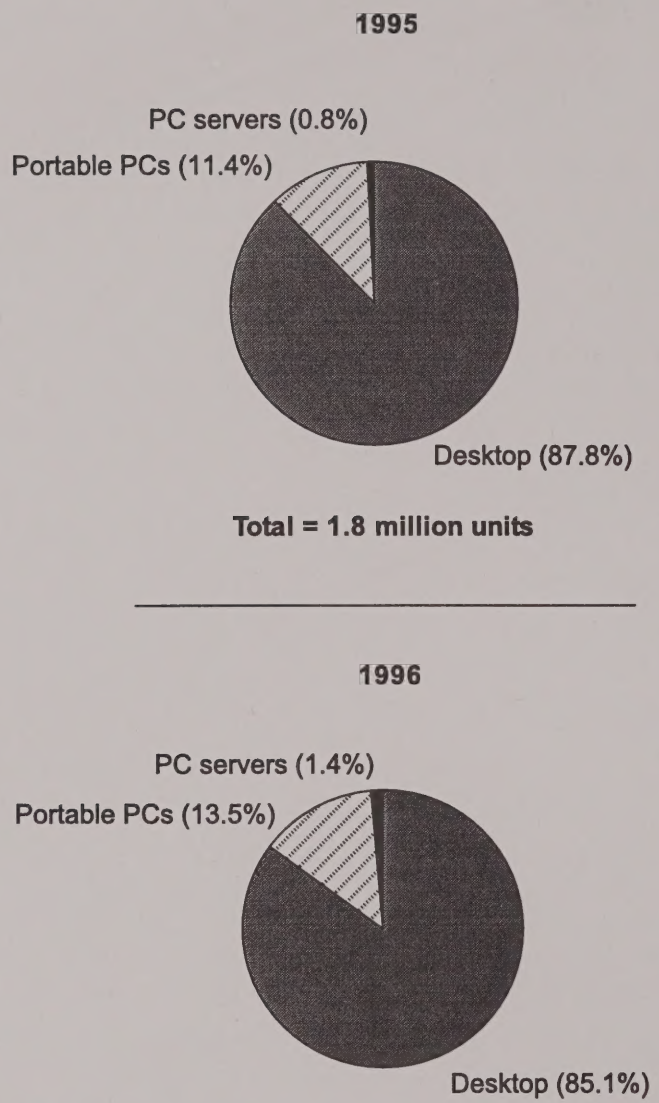
In the server market, Dell changed its approach to a solution-oriented product. With this approach, customers order the number of servers and/or desktops they need, the number of NICs, and the type of preloaded software. On the premises, Dell tunes the server software with the operating system software, improving compatibility. Other vendors rely on channel partners to perform this service.

Dell's increased efforts in servers paid off. The company was seventh in the worldwide server market in shipments in 1996, improving from 13th 1995.

DELL'S PRODUCTION SYSTEM

The direct-sales model enables Dell's efficiencies in several aspects of its business; one important aspect is its product. Dell is renowned for its build-to-order model, in which customers can customize the size of the hard drive, the amount of RAM, the processor speed, and most other configuration specifications of the machines they wish to buy. This flexibility is an important benefit to purchasers who know the specific requirements of the systems they need to order.

DELL'S WORLDWIDE SHIPMENTS BY FORM FACTOR, 1995 AND 1996



Source: International Data Corporation, 1997

As the average PC buyer becomes more knowledgeable about what different features offer with respect to performing critical business functions, that person becomes less reliant on the consultation of resellers during the purchasing process, and Dell's allure increases. To meet this demand, Dell focused attention on improving the quality of its offerings in 1996, bringing its PCs closer to best-of-breed status.

Dell focused some attention on streamlining its production process. By instituting its Optiframe chassis, it limited the customers' choice of chassis options from three to two. Customers could choose slimline or midsized Optiframe chassis, and Dell could configure the midsize as a desktop or tower model. The company cited a 30% efficiency improvement in architecture assembly after introducing the Optiframe.

Dell also grouped its product offerings in 1996. Instead of offering customers the option of choosing any component available to be configured in their machines, Dell offered only components that would meet in volume the needs of different types of users. (For example, instead of offering 820MB, 1GB, and 1.2GB hard drives to choose from, Dell may centralize on 1GB models for buyers needing midlevel-capacity hard drives.) Limiting the component set reduces the time each Dell assembler spends configuring the boxes, increasing possible daily output.

IBM and other major PC vendors are experimenting with ways to improve efficiency as Dell did in 1996. In some instances, major players are shipping components to resellers and performing final assembly in the channel.

PRICE

Dell's direct sales model offers consumers more than the ability to customize their purchase; it gives Dell a significant advantage in price. Because Dell keeps only trace amounts of product in the channel, it can pass on savings from falling component prices almost instantly. This situation proved especially significant in 1996 because of radical price drops in memory and other components.

Dell's efficiency affects price noticeably in the low-end server market, where it can shrink the margins on products that normally enjoy a price premium over standard desktops.

If Dell wants to cut PC prices across the board, it does not have to educate a legion of dealers and distributors about the cuts — Dell simply lowers its prices.

The reputation of offering the most competitive prices gives Dell an added advantage. The Dell telesales force is adept at selling up the value chain because its entry prices are low. Customers that call to purchase a PC configured with a 1GB hard drive and 16MB of RAM may find themselves closing the deal on a 2GB/32MB machine after a Dell salesperson explains the great gains in value for minor increases in price.

THE CHANNEL

Maintaining a direct-selling relationship with end-user customers has enabled Dell to bypass the channel, thereby reducing product margins. Dell develops incremental revenues by providing its customers with value-added services such as asset management, account management, and system integration and planning. It also is in the position of being able to respond more rapidly to changing buying trends in corporate accounts than can other PC manufacturers, which often experience product introduction lags and inventory glitches generally associated with selling through channels.

Having direct relationships with most of its customer accounts enables Dell to use the Internet to reduce overall costs associated with order fulfillment and to generate incremental revenue from improved account management services.

Dell has also been successful in leveraging the Internet as an indirect revenue-generation tool. From the standpoint of sales and marketing, Dell has been able to increase its visibility among prospects in the small-business marketplace and has been able to gain incremental product sales from current customers. Furthermore, Dell ingeniously has set up its Web site to be able to collect useful feedback about visitors by tracking their movements through the Web pages.

Dell considers itself a direct distributor of PC products because it undertakes both sides of the sales process: creating demand through its account representatives, who generate leads in end-user accounts, and fulfilling orders called in by accounts through its telesales force based in Austin, Texas.

Since its disastrous attempt to build a presence in retail channels, Dell believes — and rightly so — that concentrating all of its expertise in the channel it knows best is inherently better than thinly spreading resources into channels with which it has no prior experience or presence. Although other PC makers are abandoning the direct sales channel because the costs associated with establishing a direct sales force are too high, customers still demand the ability to buy directly — thus Dell will continue to succeed.

Dell's return to a focus on direct relationships with end users has proven to be especially positive with respect to growth in the direct and third-party mail-order channel segments, which should be two of the fastest-growing channels through the rest of the decade. Despite the projected decline of the direct-outbound channel, Dell's Major Account Group represents a unique business strategy within that channel, and it should continue to grow.

Dell competes in both the direct-response and direct-outbound channel categories (both of which IDC tracks). It also faces significant indirect competition from the third-party mail-order channel, especially with its DellWare catalog.

REPUTATION

In virtually a self-fulfilling prophecy, Dell's reputation in corporate markets improves as it sells more units, and it sells more units as its reputation improves. Dell's customers are educated buyers, and it targets the trade press for much of its advertising.

Although Dell's improving reputation causes concern for other major PC vendors, large corporate resellers are also feeling increased competition. Dell's direct sales model sells directly into the resellers' large accounts, thus dealers and distributors are using service and other value-adds to differentiate themselves from Dell.

As 1996 progressed and pundits watched Dell's growth, it received more and more favorable press mentions — further bolstering its reputation and further increasing the pressure on major vendors and their channel partners.

Dell's reputation within the industry also is enhanced by the top-level industry executives that joined its management team in 1996. Most recently, Dell appointed Michael Lambert to senior vice president of its server group. Lambert was vice president of marketing for North America for Compaq before joining Dell. This appointment is substantial because it underscores the emphasis the company is placing on its server division.

Dell also named a new CIO. Jerry Gregoire joined the company in July after a time as vice president of information systems for Pepsi-Cola. Dell considers him valuable for building its growing information technology infrastructure, which the company leveraged to its highest potential through Internet sales and production databases in 1996.

Cisco

In 1996, Cisco embraced the opportunities the Internet created in the router market both coming and going — literally. Much of Cisco's growth resulted from its attention to the booming Internet markets — small businesses gaining Internet connectivity, and Internet Service Providers (ISPs) providing connectivity.

In the four-quarter period ending in 1996 (Cisco quarters end January 31, April 30, July 31, and October 31), Cisco earned $4.8 billion in net sales. It earned $2.5 billion for the same period in 1995. Cisco's 1995–1996 year-on-year growth was 89%.

The Internet is fueling widespread adoption of low-end IP-focused routers within small businesses. ISPs are pushing high-end sales with their insatiable need for more connections and more bandwidth — buying the largest and fastest routers they can get their hands on. In the thick of all this was Cisco, which increased its overall router market shares to 59% and 68% for shipments and revenues, respectively.

Cisco's strong performance did not go unnoticed. Its stock opened the year at $37.25 and closed at $63.625. Cisco now must be considered in terms of overall networking, not just as a router or LAN switch vendor.

In 1996, Cisco broke from its core competency and dove headlong into the WAN market with its purchase of StrataCom. One of the leading WAN vendors, StrataCom made Cisco a major WAN player while it simultaneously opened the sales door to the major carriers for other Cisco products.

In its strongest market, routers, Cisco transitioned from direct selling to using the channel and cut the expenses of its direct sales force. It also began changing its focus to becoming more price sensitive for up-and-coming markets (e.g., small office/home office) and for its value-added resellers.

Cisco's strong performance in its core technology and its aggressive expansion into wide area networking did not go unnoticed. Its stock opened the year at $37.25 and closed at $63.625 — 70% growth. From a market perspective, Cisco now must be considered in terms of overall networking, not just as a router or LAN switch vendor.

Cisco's Markets

Cisco's take from the 1996 router market was $3.3 billion (68% share) of the total $4.8 billion. The company earned $2.1 billion in routers (58% share) in 1995. A huge contributor to Cisco's 1996 success was the lucrative high-end router segment. Although overall shipments in this segment grew less than 10%, revenues grew by 50%.

Strong revenue growth can be attributed to the increasing proportion of sales to ISPs, which buy the most complex and costly routers. As a result of growth in ISP sales, the average sales value of a high-end router jumped dramatically, from around $45,000 per unit in 1995 to an estimated $65,000 per unit in 1996. Cisco was dominant in midrange and low-range router markets also, but price pressure kept revenue growth more moderate in these segments.

In LAN switching, Cisco earned 30% of the market, with revenue of $1.3 billion. This is a key segment, and its reputation as a total network solution provider will serve the company well here. As customers decide to move to an architecture centered around LAN switching and begin replacing the router as the core piece of the network, they will look for a strategic partner, one on whose architecture they can standardize.

The vendors capable of delivering solutions for the data center are those that can provide a vision and a set of products that customers can trust. Smaller, less-established vendors will likely be successful in providing point solutions, but they are unlikely to win major backbone accounts as most customers will be reluctant to bank their whole backbone on a less-established player or nonstrategic partner.

Cisco's presence in the hub market was negligible, but because of the already mentioned importance of LAN switching, this is not necessarily a big liability.

In 1996, the big move for Cisco was its entry into the WAN switching market through its purchase of StrataCom, the number-one seller of frame relay WAN switches and the number-two seller of ATM WAN switches in 1995, with 38% and 25% revenue share in these markets, respectively.

Cisco began migrating its new WAN installed base to ATM in 1996. Its share of the frame-relay WAN market decreased from StrataCom's 38% in 1995 to slightly less than 30% in 1996 — for a little less than $300 million. Its share of the ATM market increased, however, from StrataCom's 25% in 1995 to 29% in

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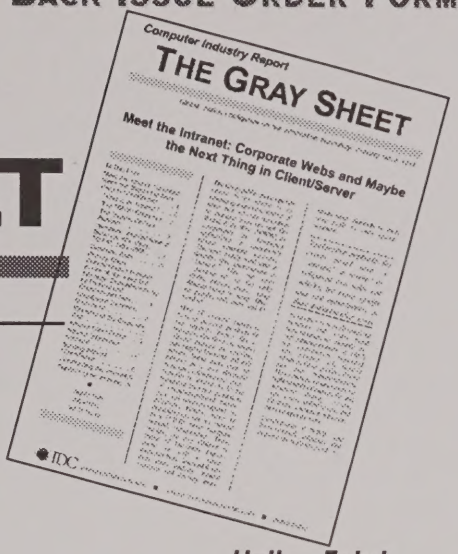

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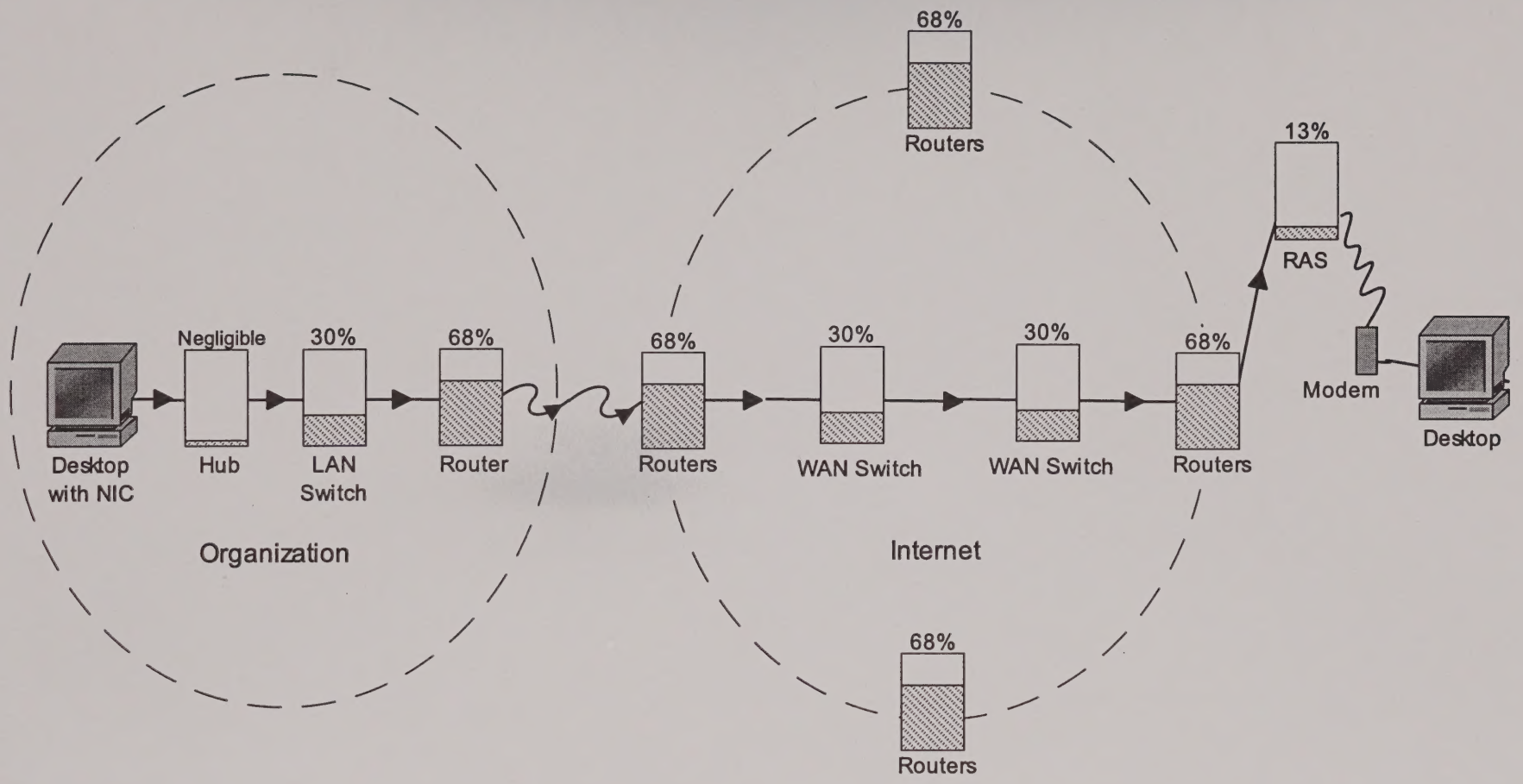
Cisco's Presence by Revenue Percentage, as a Total Networking Provider, 1996



Note: This model is based on a hypothetical Internet message sent from a LAN-connected end user in an organization to an end user dialing in to a remote access server. Obviously, other routes of Internet messaging exist.

Source: International Data Corporation, 1997

1996 — for about $150 million. Thus, Cisco's first year in the combined WAN market yielded about $450 million and 30% share (based on IDC's preliminary yearend 1996 data).

In remote access, Cisco enjoyed exceptional gains in revenue but only slight gains in market share because of the astounding growth of the market. Cisco increased its revenue share from $120 million (12% share) in 1995 to $340 million (13% share) in 1996. The total remote access server market grew 150% in revenue year over year, from $1 billion in 1995 to $2.5 billion in 1996. Cisco's corresponding revenue growth was 180%. (These growths are based on IDC's preliminary yearend 1996 data.)

Unlike in routers, where Cisco dominates the high end, Ascend and U.S. Robotics take the lion's share of the high-end remote access server market. Cisco released a high-end remote access server concentrator in late 1996, which is selling well, but it will be a challenge for the company to gain share on the two leaders. The remote access server market is filling with new entrants so quickly, in fact, that for any company to maintain share will be challenging. To increase share, Cisco will need to expand sales from its corporate IT installed base to ISPs and major carriers — not coincidentally the type of installed base it gained with its purchase of WAN player StrataCom.

The remote access server market is filling with new entrants so quickly, in fact, that for any company to maintain share will be challenging.

The diagram on the previous page shows Cisco's pervasiveness in the networking industry — measured by its revenue share for the technology segments in which it competes — illustrated by a hypothetical Internet message sent from a LAN end user in an organization to a remote access user outside the organization (literally and figuratively). This is but one scenario of Internet communication, but it shows how Cisco's presence as a total network solution provider is increasing.

Western Digital

Neither Wall Street nor industry watchers could find much wrong with Western Digital Corporation in 1996, and with good reason. WDC's annual revenue increased 46% over 1995, and its stock price reflected the company's success, opening 1996 at $18.125 and closing at $63.375. WDC's gross margins were 14.6% at the close of CY96 — its highest in 18 months.

WDC, through flawless execution and ramping of new products, exploited a hard disk drive market that already was enjoying favorable dynamics. Unlike its competitors, WDC did not aggressively try to push MR head storage technology, but instead stuck with thin-film technology and avoided the pitfalls and costs of cutting-edge R&D and product introduction.

While other companies struggled with quality-control issues for MR head products, WDC successfully met 1996's key storage capacity points (1.2GB and 1.6GB) using thin film. This execution kept WDC in the good graces of its OEM partners and allowed it time to view the MR head market from afar before investing resources in that segment.

WDC's OEM relationships are key to its success. It does 99% of its business in the desktop market and holds important relationships with IBM and other major players in the PC market.

WDC's OEM relationships are key to its success. It does 99% of its business in the desktop market and holds important relationships with IBM and other major players in the PC market. The strong sales of PCs worldwide in 1996 gave wealth to many PC makers and this wealth trickled down to WDC.

In 1996, 3.5″, 1GB capacity-range hard disk drives constituted most of WDC's shipment volume. This mature product covers the parameters required by WDC's customers, and its two-platter configuration is a

Western Digital's Financial Highlights, 1995 and 1996

	1995	1996
Total revenue ($B)	2.4	3.6
Gross margin (%)	15.3	13.4
Net income ($M)	90.8	149.3
Earnings per share ($)	1.85	3.2
Inventory turns	17×	20×

Source: International Data Corporation, 1997

cost-effective design that has proven viable in high-volume production. From 3Q96 to 4Q96, WDC improved its inventory turnover from 21 times to 24 times per quarter.

In general, the hard disk drive market is a favorable one in which storage players can operate. Two consecutive years of more than 20% hard disk drive volume growth is taxing the component infrastructure to keep pace. Shortages of recording heads — MR and thin film — remain acute, keeping the price environment stable and easing the stress as WDC introduces new products in 1997.

WDC announced two products in December 1996 that should make great gains in 1997. The first big release for WDC is its 3.5″ 2GB and 4GB drives for enterprise systems. WDC has secured business for the enterprise product at Dell, Micron, and SNI and is negotiating with other top server OEMs, thus mimicking its strategy in the desktop business.

WDC complements its 3.5″ offering with its 3″ mobile drive in the portable computing market. IDC storage analysts believe portable computer makers will design systems that can accommodate 3″ drives along with the standard 2.5″ drives. WDC's offering a 3″ drive with capacities ranging from 1GB to 2.1GB may prove profitable because of anticipated price wars in the 2.5″ drive market. WDC is transitioning its offerings from 1GB drives to 1.4GB drives.

IDC's Storage Program anticipates hard disk drive demand will be strong into calendar year 1997. Although competition will become more intense as the year progresses, WDC's biggest challenge will be to introduce its new products profitably. Finding customers will not prove difficult.

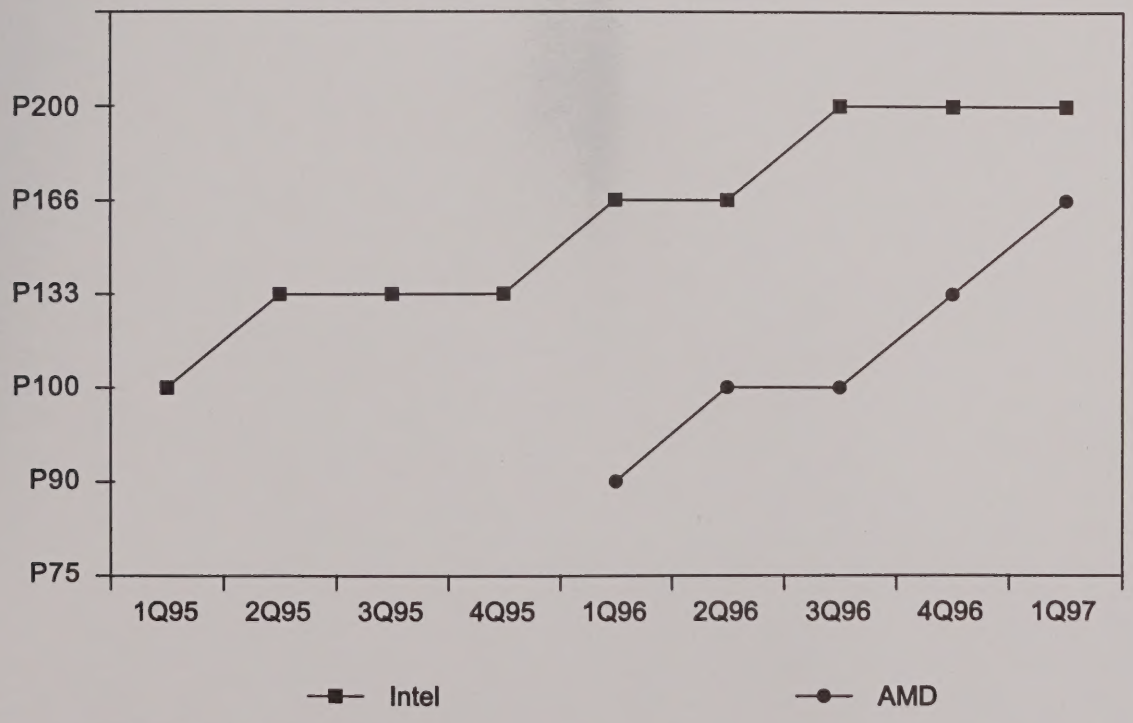
AMD

The rich get richer is cliché but appropriate in the chip market; however, in Advanced Micro Devices' case the poor made things worse for themselves in 1996.

The Intel juggernaut continued its stronghold on the processor market, but AMD's inefficiencies and lack of timeliness were responsible for the company's decrease in revenues in 1996. Yearly revenues shrunk to $1.9 billion from $2.4 billion in 1995 — a 20% decrease.

AMD's problems are symptomatic of playing in a market dominated by a single vendor. By

FIFTH-GENERATION PROCESSOR OFFERINGS, AMD VS. INTEL, 1Q95–1Q97



Source: International Data Corporation, 1997

the time AMD gets product to market, Intel has released chips that are faster and better and is looking ahead to the next generation of product. AMD and other chip competitors are forced into low-margin relationships from the outset.

That AMD has trouble getting product to market in time to be competitive with Intel was evinced by the problems it had with its K5 line. AMD designed its K5 chip to be competitive with Intel's Pentium. Unfortunately, by the time it released 75–90MHz versions of the product in May/June 1996, Intel was already shipping Pentiums with 133–166MHz capability.

This lag in delivery cost AMD more than just market share in 1996. AMD's clients are mostly third-tier computer vendors based in Asia/Pacific and Latin America; big U.S. vendors do business with Intel. Bookings are small, and AMD's large manufacturing capacity remains unused. Bookings are so low, in fact, microprocessors are no longer AMD's biggest revenue generator.

AMD's Flash memory revenue overtook microprocessor revenue in 1996. AMD is the largest vendor after Intel in the Flash market, but it suffered the same fate here as it did in the microprocessor market. Intel began adjusting its Flash prices down in response to a buildup in supply, and AMD failed to follow suit fast enough.

Despite AMD's lackluster 1996, investors appear optimistic about the company. AMD's stock gained nine points (72%) through 1996.

Despite AMD's lackluster 1996, investors appear optimistic about the company. AMD's stock gained nine points (72%) through 1996, coming on strong in the final six months. Although some investors may see AMD as a potential takeover target, much of the buying spree may be attributed to strong expectations for the PC market. Also, AMD increased its book-to-bill ratio to above 1.0 for the first time in recent quarters and doubled its unit shipments of K5 chips from the third to fourth quarter.

AMD also has a chance for success as the processor market transitions to multimedia extensions. The company has licensed MMX technology from Intel, and the K6 incorporates these instruction sets. If AMD executes properly, it has a big opportunity — Pentium with MMX Technology and Klamath will be around for a while. AMD promoted the K6 aggressively at Comdex and with some success. Many major vendors are sampling the chip and conducting testing — a sign that AMD is close to releasing it.

Although AMD's 5%-and-shrinking share of the processor market may appear to be a signal to get out of the business, that 5% still represents a lot of revenue. If AMD executes properly with K6, and if it can improve its time to market with its products in general, it can regain some lost share.

PARCPLACE-DIGITALK

The Internet giveth, and the Internet taketh away. ParcPlace's poor earnings stand as testimonial to the amount of leverage the Internet concept held in the IT industry in 1996. Even in immaturity, a programming language hyped for its Internet friendliness (Java) brought damage to its more-established brethren.

To understand ParcPlace's woes in 1996, one first must understand the market dynamics of object-oriented programming, a technology that offers programmers rich functionality and efficiency, but is yet to be adopted at the MIS level because of its complexity.

Prior to 1996, the only significant object-oriented programming languages were C++ and Smalltalk. Of these, Smalltalk is the true object-oriented language — C++ is a hybrid. As programmers began to realize the benefits of object-oriented programming (reuse of code, more manageability, etc.), the interest in C++ and Smalltalk grew.

C++ offers specific object-oriented programming benefits to programmers, including modularity, encapsulation, and information hiding (and it's a logical progression for programmers who have worked in C), but it is a complicated skill set for programmers to master.

Smalltalk offers some benefits over C++ for the typical MIS shop. It is less complicated than C++ and offers housekeeping functions like memory management built in. Smalltalk also offers a rich set of reusable classes of code. At the beginning of 1996, its growing acceptance as a language (and thus the continued success of ParcPlace) seemed likely.

Instead, what 1996 brought for Smalltalk and ParcPlace was Java — and with it all the hype Java produced. The expectations for Java caused many companies to forego investing in Smalltalk and C++ despite that full functionality for the new language is still some time away.

With all of its media attention, Java brings some tangible benefits to the object-oriented programming world. It combines the elements of C++ and Smalltalk. Its programs look like C++,

making for easy transfer of skills for C++-trained engineers, and like Smalltalk Java is portable and can run anywhere that supports a Java run-time environment. Java is distributable and has built-in security functions. After another year of development, Java's set of class libraries will be as rich as Smalltalk's.

Expectations for ParcPlace-Digitalk tumbled with the publicity surrounding Java. The company's stock dropped from its $8.25 opener at the beginning of 1996 to a final $2.94 at yearend. The company's revenues fell from $49.1 million in 1995 to $44.8 million in 1996, a decrease of 9%. ParcPlace's net loss for calendar year 1996 was $17 million.

The merger of ParcPlace and Digitalk did not necessarily help matters for the company in 1996. Combining the installed users of the two companies' products proved challenging, and the other major player in the Smalltalk development market, IBM, aggressively pushed its VisualAge product. (IBM, which acquired Object Technologies to make the Smalltalk market a two-man race, may have given the VisualAge product away in an effort to lure ParcPlace-Digitalk users.)

IDC forecasts the Smalltalk environment will continue to grow as a market while Java comes to maturity. However, with IBM gobbling up share of the remaining Smalltalk environment, ParcPlace-Digitalk will continue to lose opportunity there. ParcPlace-Digitalk has directed some of its resources toward Java programming in 1997.

BAY NETWORKS

Money didn't solve everything for Bay Networks in 1996. The company's perception on Wall Street plummeted despite an increase in revenue of nearly $500 million from calendar 1995 to calendar 1996, and turnover in upper management kept the company in the spotlight of negative publicity.

Bay's revenue for 1996 was $2.1 billion, compared with $1.7 billion for 1995, but the increase belies the stagnancy that has beset the company since the first quarter of 1995. Revenues increased from $337 million in 1Q95 to $560 million in 2Q95 and remained at about $500 million per quarter through the close of 1996, but they failed to climb any higher.

Investors did not find this flat revenue acceptable considering that the markets Bay competes in were experiencing between 30% and 250% growth. Bay's stock opened 1996 at $40.125 per share, peaked at $49 per share early in the year, then declined dramatically to close 1996 at $21.

Part of the financial community's discontent with Bay may be attributed to net losses of more than $172 million in the final calendar quarter. A closer look at Bay's financial statements reveals many of the losses to be due to acquisitions that may prove strategic to Bay's future in the networking industry, but as 1996 closed, these losses were more than the market would bear.

Another part of investors' discontent may be due to the turmoil that surrounded Andrew Ludwick's resignation. The former SynOptics head formally stepped down in October, when Bay announced David House to be the new CEO, chairman, and president, but rumors of Ludwick's departure circulated long before he announced his intention to leave (back in July).

BAY'S MARKET PERFORMANCES

Bay Network's biggest play is in the hub market, but its strength may have contributed to its struggles in 1996. The company drew $862 million of its revenue from hubs last year, with a noticeable presence in higher-end products. Unfortunately for Bay, customers are beginning to migrate from shared hubs to LAN switches. In the modular ethernet hub segment, where Bay sells its high-end System 5000 product, market revenue dropped from $485 million in 1995 to $300 million in 1996.

Customers consider Bay a strategic provider in the hub and switch market, but the company has had difficulty providing the solutions customers have wanted and has been slow to develop low-end products. Bay has drawn criticism from industry watchers for its failure to transition customers to switching. It's share in the LAN switching market is only 10%, on revenues of $374 million. In 1996, Cisco's revenue from the switch market alone eclipsed Bay's combined hub and LAN switch revenues.

To gain on its competitors, Bay must improve in the switching arena. LAN switching is beginning to form the core of network architecture, so vendors must provide a complete system solution.

To gain on its competitors, Bay must improve in the switching arena. LAN switching is beginning to form the core of network architecture, so vendors must provide a complete system solution. The leaders will be vendors with strong customer accounts, the best marketing messages, and

the best channel strategies. Because of the critical position these vendors will play in corporate information management, customers will choose companies they believe will be around for a long time.

Bay's acquisition of NetICs represents a commitment and a realization that it needs to deliver on high-performance, cost-competitive switching technology if it wants to compete for wiring closet bids. It allows Bay to deliver 10/100Mbps ethernet solutions at sub-$250 pricing. Also, NetICs will allow Bay Networks to quickly deliver on next-generation autosensing 10/100Mb technology and gain internally developed ASICs to port onto other product platforms.

In the 1996 router market, Bay held its second-place position, playing second fiddle to the dominant Cisco. Bay increased its year-end revenue from $553 million in 1995 to $576 million in 1996, but this 4% increase did not match the market's overall revenue growth of 30%. Bay's revenue share decreased from 14.9% in 1995 to 12% in 1996.

Bay maintained second place in the router market because of its reputation as a strategic partner. Because it can provide high-performance systems with broad functionality, Bay could meet the demands of the large-scale internetworking environments like ISPs and large corporations.

With its acquisition of Xylogics at the end of 1995 and its acquisition of Penril DataComm in 1996, Bay networks appeared ready to make a strong foray into the remote access arena, but its business stalled.

Across the board, remote access vendors had a disastrous second half for fixed-port servers, but most compensated for this in the concentrator segment. Bay, whose presence in the concentrator segment is still negligible despite its purchase of Penril (about 1%), did not recoup fixed-port losses.

Bay Networks spent $120 million on Penril for its modem technology. For Bay, having an "in-house" source for modem technology should prove strategic as a supporting mechanism for its remote access server concentrator products, but so far the company has been unable to get its concentrator business off the ground.

Bay's combined share of the remote access server market (including fixed-port and concentrators) dropped to about 5% in 1996. Bay needs to recover quickly for 1997 and reassess its position in the remote access concentrator segment, where the growth is so abundant.

Bay Mixes Up Its Management

Bay had its fair share of leadership issues in 1996, which only added to the concern of investors and industry watchers.

On October 30, Bay Networks hired David House, a 22-year Intel executive, as president, CEO (replacing Andy Ludwick), and chairman (replacing Paul Severino). It has become clear that Bay Networks' board of directors was unhappy with the company's management and mediocre performance in a market showing substantial growth. Severino, a founder of Wellfleet, will stay on as a director. The hiring of House is a good move that should, at the very least, unify the management and agenda at Bay Networks.

It is clear that Bay's board of directors wanted to address the company's split-leadership problem caused by having the SynOptics segment of the company run by Andy Ludwick in California and the Wellfleet portion led by Paul Severino in Massachusetts. The hiring of House unifies the role of president, CEO, and chairman. Essentially, this hiring finalizes the merger of SynOptics and Wellfleet.

House will need to draw upon all his experience to get Bay Networks out of its slump. At Intel, he led the effort to get IBM to use its processors in IBM's first PC, helped introduce the "Intel Inside" campaign, and helped set up important strategic alliances (such as the 64-bit architecture alliance with Hewlett-Packard in 1994).

In the near term, Bay's new leader must find a way to improve the company's lackluster quarterly financial performance to prevent further decline in its stock price. Over the long haul, the company must position itself to take advantage of growth in LAN switching, gigabit ethernet, VLANs, and ATM switching. The first order of business will be to improve the effectiveness of Bay's marketing message and fix its back-order problems.

Computer Industry Report

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For IT Decision Makers, Online Training Is Just in Time

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March 1, 1997
IDC #13099
Vol. 31, No. 24

Good help is hard to find.

Nearly one-fifth of top U.S. IT executives rated the lack of skilled personnel as the most serious constraint to the growth of their businesses in 1997, according to IDC's 1997 Global IT Survey — but cost-effective help is on the way.

The overall U.S. IT market is prospering at 11% year-over-year growth, 1996–2000. The U.S. IT training market is more than keeping pace at nearly 14% growth over the same period.

However, surging ahead of the steady growth of these markets are the growth rates for just-in-time training opportunities. CD-ROM-based multimedia training solutions and online, or Web-based, training solutions are exhibiting 35% and 108% incremental growth for 1996–2000.

What do these solutions offer training purchasers?

- **Cost benefits.** Content is less expensive per end user when it's delivered through technology-based solutions rather than lecture-based solutions.
- **"24 × 7" access.** Users can access the content of lessons anytime they have access to the network or a CD-ROM drive, which in most cases is all the time.
- **Quality presentation.** IT trainers rate animated demos and learn-by-doing examples as essential value-adds beyond the bland offerings of computer-based and textbook-based learning.
- **Fresher content.** Web-based products offer the opportunity for administrators to update lessons and materials across the entire network instantly.

Historically, cost and time restraints have limited executives' and managers' inclinations to liberally enlist employees in traditional training programs. Instructors for lecture-based training classes can be expensive, and the technologies that students must learn change quickly. Executives often weigh the cost of classes, combined

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with opportunity costs and the rapid obsolescence of the training, and opt not to invest.

Multimedia-based just-in-time solutions offer reliable training at costs managers can justify. Some off-the-shelf CD-ROM training products are available for less than $50, and Internet-based courses are on the market for as low as $4.95 per month (although the multimedia aspect of these Internet offerings is rather limited).

However, just because training solutions delivered by CD-ROM and the Internet/intranets are available at low cost does not mean the market for these products is mature. Users are demanding specific improvements/changes in current technology-based training programs, and vendors with creative solutions to meet these demands will succeed.

CD-ROM and Web-based training solutions are changing the way corporations deliver training in nearly all segments of business. IDC concerns itself with training directed at IT-related learning issues, but it expects growth in technology-assisted training to address non-IT-related issues as well.

CD-ROM and Web-based training solutions are changing the way corporations deliver training in nearly all segments of the business process. IDC concerns itself with training directed at solving IT-related learning issues, but it expects growth in technology-assisted training to address non-IT-related issues as well. Compliance training, sales training — even customer service training — all lend themselves to delivery directly from a CD-ROM or intranet at much less cost than lecture-based training.

This issue of *The Gray Sheet* will look at the offerings available to training purchasers and the market opportunities for training vendors in CD-ROM- and Web-based training solutions. At present, the two technologies share some advantages and have some distinct attributes of their own.

WHAT IS MULTIMEDIA-BASED TRAINING?

Multimedia training is training delivered at the desktop, utilizing the audio, video, and graphics capabilities of available software and hardware technologies. CD-ROM multimedia training is the aforementioned training delivered to the desktop in CD-ROM format; Web-based multimedia training is such training delivered via intranet or the Internet.

Although not required for a product to be defined as "multimedia," interactivity is an important quality most multimedia products incorporate. One major complaint with traditional computer-based training, as described by users, is that it's the same as text-based page turning, but even harder to read. The advent of multimedia affords training providers the opportunity to embed various levels of

interactivity at many levels of the electronic tutorial, and it lets the trainer draw the user in.

Nearly all multimedia training products come complete with chapter tests and overall course examinations; developers realized early that the ability to track students' progress was a valuable selling point to training purchasers. However, good products use interactive lessons to get the learner involved before the examination stage, and they take advantage of the old 4-H Club philosophy of "learning by doing" as opposed to learning only by reading.

WEB-BASED IT TRAINING SOLUTIONS

IDC classifies Web-based training as offering on-demand training stored on a server and accessed via a browser. Web-based training can combine self-paced study, asynchronous communication, and live, instructor-led capabilities.

The primary driver for Web-based training is the need to find ways to deliver just-in-time continuous learning directly to the desktop. Customers have limited time for improving their skills, and Web-based training offers a quick way to pull up a course or tutorial without causing a major work interruption.

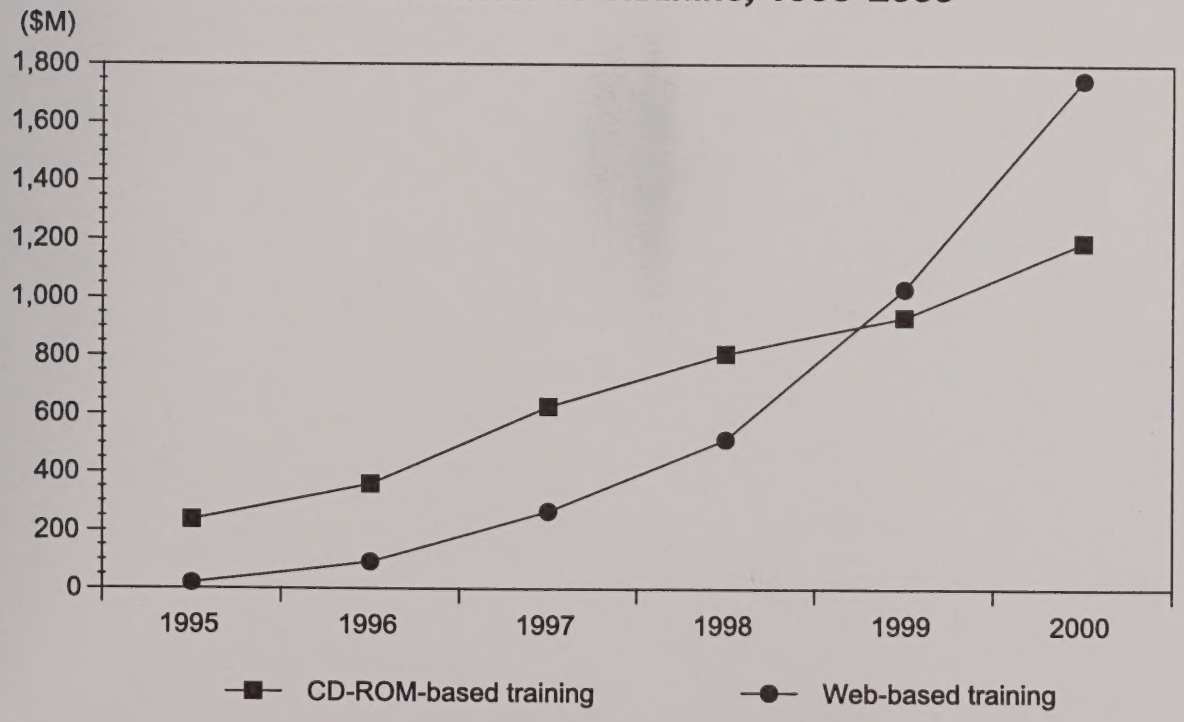
Another major driver of Web-based training is the need for remote training that is not locked into one proprietary package on one platform (such as Mac, PC, or Unix). With an increasing number of workers telecommuting or servicing customers off site, tools that offer cross-platform access are a necessity.

The need for libraries consisting of a variety of content also is an important driver. Web-based training suppliers can provide customers with the ability to search and retrieve a curriculum that fits their immediate needs, offering an element of customization to the learning process.

THE PRESENT WEB TRAINING LANDSCAPE

IDC projected the market for Web-based training to be $92 million in 1996 and forecasts it to grow to $1.7 billion in 2000 (108% growth compounded annually). It is projected to surpass the CD-ROM training market in revenues in 1999 (see *The Market for Web-Based*

GROWTH OF U.S. WEB-BASED IT TRAINING VS. CD-ROM-BASED IT TRAINING, 1995–2000



Source: International Data Corporation, 1997

Training: A Look at Current Developments in Internet and Intranet Course Delivery, IDC #12602, January 1997).

Web sites for IT training come in two flavors — facilitated, multisupplier, campus-style sites and single-supplier, course-delivery sites — but these flavors are becoming harder to distinguish.

The campus-style site offers features such as tutorial sessions with instructors, chat rooms to meet classmates, pretesting and posttesting, and more. This type of site is a distribution center for a variety of third-party training providers to offer their content and services. The startup costs for the campus-style Web site are fronted by the owner of the main campus, and third-party providers pay administrative fees to offer their content on the site.

Conversely, course-delivery sites offer course listings and courseware from a single provider. Some course-delivery sites offer preassessment and postassessment courseware and other forms of curriculum customization. However, IDC's recent discussions with vendors and end users brought to light a preference for fewer proprietary offerings and more best-of-breed courseware. Single suppliers may not change their models to offer facilitated discussions and chat rooms, but they likely will provide choices in third-party courseware.

OPPORTUNITIES

Specific opportunities for Web-based training fall into three categories: opportunities for the student or purchaser, opportunities for the training supplier, and opportunities for other service providers.

Economies of scale offer students the opportunity of less expensive training. Web-based training is cheaper to administer per seat from a centralized server; therefore, intranet corporate users and individual Internet users usually benefit financially.

Students who have a hard time following training material during a traditional instructor-led class can solidify training by working at their own pace because of 24 × 7 access to courseware.

Web-based training offers purchasers/managers the opportunity to track students' performances centrally and to update course materials simultaneously at all sites that access the server.

Training suppliers that transition to Web-based delivery have lower distribution costs, enabling increased margins and the ability to pass savings on to customers. (Training company NETG estimates that its Web-based training provides a 60% cost savings for its customers.)

Web-based training offers vendors a new channel and a new target audience, and it opens doors to relationships with other service providers.

Systems integrators, consultants, and value-added resellers (VARs) will find ample opportunities to forge alliances and partnerships with training suppliers in the Web-based training

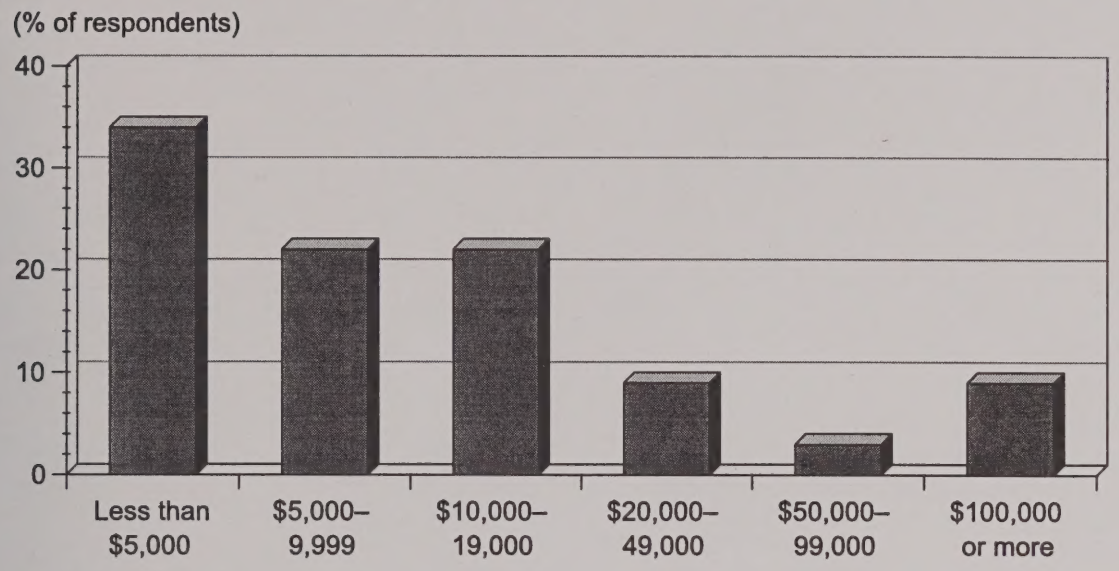
COST TO IMPLEMENT AND MAINTAIN AN ACTIVE COMMERCE-BASED WEB SITE, BY COMPONENT

Cost Component	Cost Range ($000)
Hardware (primarily high-end servers)*	150–200
Software (off the shelf)	10–50
Staffing, custom development, and design	500–800
Support and maintenance (for 12 months)	180–200
Total	840–1,250

* Note: The development of NT servers for Internet commerce may reduce the average hardware costs as companies move to next-generation commerce-based Web sites.

Source: International Data Corporation, 1997

AVERAGE COSTS OF INTERNAL WEB APPLICATIONS (SERVER PURCHASE, INSTALLATION, AND APPLICATION DEVELOPMENT)



Note: Mean cost = $25,375
Source: IDC's *The Path to Internet Migration Questionnaire, 1996*

delivery arena. Organizations will develop expertise in installing, maintaining, and supporting Web training systems, and they will offer service contracts to both end customers and training suppliers.

Consultants specializing in the conversion of training content to the Internet/intranets will be in great demand, as will graphics experts and marketing gurus. The specific features that will keep customers coming back to an Internet training site have yet to be determined (although it is implicit that students will come back to an intranet site because it has been configured for their particular business needs).

DISADVANTAGES OF WEB-BASED TRAINING

The main drawbacks to delivering training via the Internet or corporate intranets are the cost of site development, administration, and maintenance, and performance bottlenecks/lack of bandwidth. For training vendors and purchasers, development of major Web sites inevitably takes longer than anticipated, and developers often underestimate costs.

According to *The Marketeers' Internet: Motivations, Costs, and Customization* (IDC #11128, March 1996), the average large Internet Web site with significant electronic commerce orientation costs $1 million and takes about 12 months to develop and launch. More significantly, cost and completion schedules are substantially underestimated in nearly all cases. For typical Web commerce sites, site development takes twice as long as expected, and cost runs four times greater than expected — thus posing a barrier for some training vendors.

Purchasers looking to install an intranet will spend significantly less money, but the cost probably won't be justified for training applications alone.

In terms of performance bottlenecks, training suppliers are frustrated by their inability to provide rich multimedia content over the Internet/intranets because of lack of network bandwidth and accompanying technologies. However, most training suppliers anticipate improvement in these areas. Once the infrastructure is in place, delivery of class libraries will be increasingly cost effective, and tools and bandwidth that afford more interactivity and improved multimedia content will be available.

Developers have bypassed network limitations for the time being through the creation of hybrid CD-ROM solutions.

HYBRID CD-ROM

IDC believes that until training suppliers can provide courses with full-motion video, rich graphics, and simulations on the Web, a market for a combination hybrid Web/CD-ROM training will exist. Training suppliers that have invested in developing multimedia CD-ROM and those planning to invest in DVD-ROM should incorporate links to their Web training content within their CD-ROM tools.

Clearly, hybrid Web/CD-ROMs solve some of the deficits of the Web and the CD-ROM because the user gains access to both high-bandwidth content and up-to-the-minute content. Also, when users do not have access to the Web (as at airports or some antiquated hotels) their only way to access training will be via a CD-ROM. Training organizations will need to remember these scenarios when developing their customer training solutions.

IDC believes DVD-ROM technology also will play an important role in the multimedia training market because it offers vast improvements in speed and memory, enabling more complex animation and video delivery. A single layer of DVD-ROM can store 4.7GB of data, seven times that of CD-ROM, and can deliver the data at speeds faster than an 8× CD-ROM drive (see *DVD: The High-Capacity Replacement for CD-ROM*, IDC #11711, June 1996, and *DVD Impact Analysis and Forecast*, IDC #11733, August 1996).

MULTIMEDIA CD-ROM-BASED TRAINING SOLUTIONS

Multimedia CD-ROM-based solutions, like Web-based solutions, are just-in-time training tools delivered to the desktop. In today's market CD-ROM delivery still holds a few advantages over Web-based delivery of training, but how long it maintains these advantages remains to be seen.

Because of network bandwidth issues, CD-ROM remains a more effective method of delivery for full-motion video and animated demos — the most important features that training purchasers look for when choosing multimedia training products.

CD-ROM-based training still is a less expensive option than Web-based delivery in many instances. Web-based training has the potential to be a very inexpensive form of training delivery, but it is subject to economies of scale. Only companies that need to train significant numbers of employees realize the cost benefits of delivery over an intranet.

THE CD-ROM-BASED MULTIMEDIA TRAINING LANDSCAPE

IDC projected the CD-ROM-based training market at $359 million in 1996 and forecasts it to grow to $1.2 billion by 2000 (35% growth compounded annually).

CD-ROM multimedia training products frequently are sold off the shelf as solutions for common training problems (like instructing employees how to use popular office desktop applications). These straight-from-the-box solutions can cost anywhere from $50 to $2,500 (depending on whether customers buy standalone products or site licenses).

Some vendors develop custom training solutions on CD-ROM. These solutions can use content provided by the customer or that created by the vendor according to customer specifications. Custom projects vary wildly in price depending on the amount of content the vendor creates compared with the amount of content the customer develops on its own.

OPPORTUNITIES

According to IDC's *1995 User Needs and Requirements for IT Training and Education* (IDC #10865, December 1995), IS managers and business unit managers differed in their perceptions of who was responsible for establishing relationships with outside training providers. IS managers surveyed felt they were responsible for training relationships more than were other groups in the company; business unit managers saw training relationships as more of a department-by-department responsibility. This data clearly shows that no de facto training purchaser exists within the corporation today. The implication is that training suppliers will need to use varied means of marketing and selling to address the training needs of disparate groups that make up the corporate entity.

Most off-the-shelf CD-ROM solutions are inexpensive enough that business unit managers can purchase them through their department budgets without needing approval of higher management or the corporate IS department. Business unit managers can also buy the CD-ROM multimedia training products that address applications or business-unit-specific problems. IDC believes CD-ROM multimedia training vendors should address business unit managers and IS managers in their marketing.

In a targeted survey of known IT training purchasers, all respondents said they used instructor-based delivery to train their employees; more than 70% indicated they used computer-based training, and 27% indicated they used CD-ROM-based multimedia training. Vendors have a large opportunity to transition the computer-based training users to CD-ROM-based multimedia training.

Disadvantages of CD-ROM-Based Multimedia Training

The key disadvantage to CD-ROM-based training, especially when compared with Web-based training, is that lessons cannot be amended without the subsequent purchase of a newer CD. Although a Webmaster can alter the training programs delivered to a company by altering the programs residing on a central server, corporate trainers who deliver courseware through CD-ROM must replace the discs when they transition to newer materials.

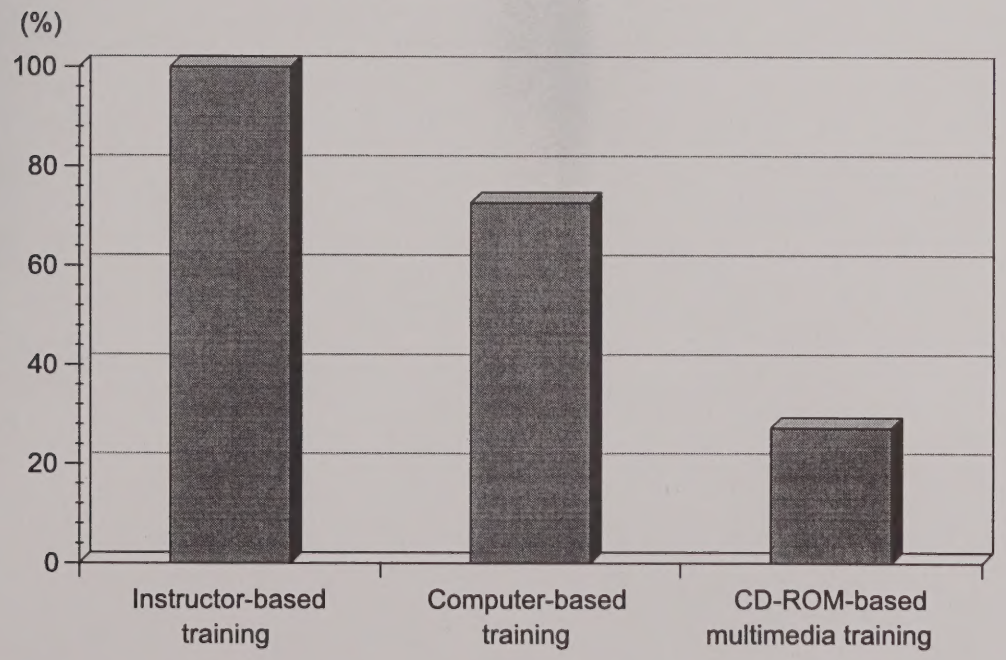
A lesser disadvantage, but a disadvantage nonetheless, is that many CD-ROMs are platform dependent, whereas Web-delivered training can go to any browser-equipped desktop.

What Does Multimedia Training Mean for Vendors?

Training purchasers are clear in their expectations for multimedia-based training; it must offer self-paced learning and detailed content – with levels of interactivity and speeds of delivery advanced enough to make the investment worthwhile.

In the early growth stages of this market, purchasers' expectations mean many opportunities for training vendors and many choices, as well. Should entrepreneuring vendors invest in developing Internet commerce-based models, or should they pair up with service providers and offer intranet solutions? Should

Types of Vehicles Customers Use to Deliver IT Training at Their Sites



Source: IDC's *CD-ROM Multimedia IT Training Survey, 1996*

CONTENT IS KING

The content of courseware will continue to reside at the top of the list of customer requirements for technology-based training, as it does for training delivered through more traditional vehicles. In conversations with IDC analysts, nearly one-fifth of training purchasers rated content an important factor in choosing a training delivery vehicle; thus vendors that establish a reputation for thorough, informative courseware will do well in winning the minds of IS managers and business unit managers, who ultimately hold the purse strings in the equation.

Buyers who are willing to pay big money for custom-made solutions are proof that the content of off-the-shelf solutions has not evolved to a level of universal acceptance. Although a market will always exist for custom solutions to address issues that vary from company to company, the need for custom solutions to provide training for common business software applications should go away.

Vendors who take advantage of the audio, video, and interactive capabilities of multimedia when presenting their content will find the most success. Sensory appeal plays a strong supporting role in the purchase decision. Full-motion video, animated graphics, and colorful narratives — to various degrees — get users excited about the lessons unfolding on the electronic stage in front of which they sit. Vendors that play to the human "beauty bias" will dazzle their way into the hearts of users who normally wouldn't be stimulated by the concept of extra tube time.

However, some vendors report a backlash from this technique because video and audio can be slower than the mind's patience will stand. Companies like Microsoft and Learning Tree say feedback from some high-power, high-tech learners says off with the talking heads and onto the meat of the matter. Good products offer scroll keys, fast-forward buttons, or other escape routes to permit the user to skip through the glitz without skipping past important pieces of information.

vendors develop the content for their solutions, or should they concentrate only on production? Are they better off providing mass-produced, off-the-shelf-style products, or should they develop custom products tailored for their customers' needs?

Buyers of training demand all of the aforementioned offerings, depending on the scope of their training projects. Each venture differs in its cost of goods sold and return on investment. The factor that will affect bottom lines the most is not which venture vendors pursue, but how they pursue it. Training providers that offer their customers quality content and a clear plan for delivering this content to end users in the most cost-effective manner will be the big winners in technology-based training, and as time goes by, in the training market overall.